THE IRON TRADE REVIEW

VOLUME XXXV CLEVELAND, O., MAY 29, 1902 NUMBER 22

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Labor questions have become increasingly significant to the iron trade in the past week. The anthracite strike has caused some curtailment already of pig iron production in the Lehigh and Schuylkill Valleys, and this will go further if the strike is prolonged. The Connellsville and other coke regions show an increased output, but this will not be sufficient to make up for the cutting off of anthracite shipments to furnaces that have been using two-thirds coal and one-third coke. The strike of puddlers in Central and Eastern Pennsylvania involves eleven plants and is still unsettled. The Amalgamated Association has actively recruited in the affected districts in the past few months. The test will come within the next week, of the ability of the blast furnace workers' leaders to tie up the furnaces of the Central West by their demand for eight-hour instead of twelve-hour turns. From the best information available the situation is not as alarming as recent reports would indicate. Individual furnaces may be shut down but there will be no general strike. The impossibility of getting 50 percent more men than are now at work makes the men's position untenable. The influence of the blast furnace workers' union has been exaggerated. At most it will only be felt in spots. The pig iron market, under a combination of influences, chiefly the fact that consumers have covered the bulk of their wants for this year, and the well-known fact that few producers can offer round lots for delivery before Jan. 1, has been quieter in the week. Southern sellers who recently re-entered the market have withdrawn again, and now there is very little offering of Southern iron for this year. The buyer must go after it and pick up here a little and there a little. Prices are being advanced in this operation. On forward deliveries they are $17 to $18 Birmingham for No. 2 foundry, with higher prices paid for small lots of prompt iron. Southern gray forge ranges from $15 to $16 Birmingham. A 20,000-ton purchase by a leading Northern consumer is reported at $18.75 delivered at Mahoning Valley mills, equivalent to $15 Birmingham. Small lots of Northern forge have sold as high as $20.75 for early delivery in Pittsburg. In Bessemer iron sales of 6,000 tons are reported at $19.50 to $20 at furnace, deliveries from Oct. 1 to April 1. The report that the United States Steel Corporation has made a large purchase of Bessemer iron for the second quarter of 1903 is unfounded, though it will probably make such purchases in June. Merchant furnaces are all behind on their deliveries of Bessemer iron to the steel corporation, and the output of steel works is still inadequate to the demand. The present level or one approximating it is likely to be maintained in billets for months. No increase in Bessemer capacity is expected, the Lackawanna Bessemer plant at Buffalo, when ready, merely replacing that at Scranton. Rail tonnage in prospect for the next year gives little promise of an increasing output of Bessemer billets. Importations of steel continue, though in April they amounted to but 12,000 tons, or a daily average of about one-fifth the output of a converting plant of two 10-ton vessels In the Chicago district inquiries are pending for 12,000 to 15,000 tons of German steel. Chicago reports the sale of 10,000 tons of rails at $27, cleaning up the stock of "seconds" at the local mill. Finishing mills continue under pressure, particularly in structural steel and plates. The plate mills are offering very little material, but here as in some other lines buyers who offer premiums seem able to get what they want, and buyers whose contract deliveries are belated have questioned in some instances whether this prompt business is not in part at their expense. In agricultural steel sales have been heavy enough to take one interest out of the market to July 1, 1903. Buying of structural shapes for delivery after Jan. 1 goes on steadily, and some little foreign material is expected to come in in the next six months.

PITTSBURG.

(Special Telegram.)

PITTSBURG, May 28.—It can be stated on authority that steel rail manufacturers will meet within the coming week and fix the price for next year's delivery. Books will then be opened for business for 1903. It is believed the $28 basis will be continued.

OFFICE OF *The Iron Trade Review*, }
429 PARK BUILDING, May 28, }

The blast furnace workers in the Mahoning and Shenango Valleys have now decided to strike at midnight on Sunday, June 1, unless their demands for an eight-hour day are granted. The position of the operators remains unchanged and it is now for the Blast Furnace Workers' Association to shut down the furnaces as they have threatened for several months past. The feeling among operators generally is that the strike fever is strong among a few leaders only and that when the hour arrives for leaving the furnaces there will be comparatively few men that will go out. Of course there may be surprises and should a general strike occur the situation would be very grave not only for the furnaces but for steel producers as well, as the closing of the furnaces for an indefinite period would result in cutting off the production of an immense tonnage of Bessemer iron daily. The strike situation in the Eastern portion of this State remains unchanged and the ranks of the strikers at the plants of the American Iron & Steel Mfg. Co., Reading, Pa., have been augmented by the lodge of finishers who belong to the Amalgamated Association, the latter walking out on account of the refusal of the company to grant them an increase amounting to 8 percent.

The strike of the anthracite miners in the Eastern and Northern sections of the State has resulted in the placing of orders for coke by some of the furnaces dependent upon the anthracite region for their fuel supply, and every available oven in the Connellsville region is being pressed into service to meet this increased demand. The production of coke in the Upper and Lower Connellsville regions for the week ending Saturday, May 17, amounted to more than 280,000 tons, which is nearly the record mark for the regions. Yet there are no accumulation of stocks and with the immense furnace capacity in operation as at present the capacity of the region is none too great to supply the demand.

The pig iron market continues its upward march and small lots of Bessemer iron for early delivery have been sold during the week at $22.25, Pittsburg. No. 2 foundry iron is also selling at $22, Pittsburg, while gray forge from Northern furnaces commands $20.75. Sales of Bessemer iron running through the first quarter of next year have been made during the past few days. Contracts for 6,000 tons have been closed for delivery from October 1 to April 1, 1903, at prices ranging from $19.50 to $20 at the furnace. These sales practically fix the price for first quarter delivery next year and will probably form a basis for the establishment of prices for the entire first half of 1903. When the constituent companies of the United States Steel Corporation placed their order for Bessemer iron through the first quarter of next year a price of $16.50 at the furnace was established, but since that purchase was made the market has been creeping upward and that price is no longer considered the basis for fixing the prices to outside concerns. There have been heavy purchases of forge iron for delivery through

the second half of the year, by the American Steel Hoop Co., amounting to about 20,000 tons. The major portion of this iron was purchased from Southern furnaces on a basis of $15, Birmingham, of $18.75, delivered Youngstown, which is fully $2 per ton below the price of Northern forge.

In the wire and wire nail trade the spring rush is over and many of the independent producers are anxiously looking for business to keep their mills in full operation. While we have not yet been advised that ruling quotations have been shaded it is believed that the high prices of rods and billets alone prevent shading on the part of some of the small interests.

The regular monthly meeting of the steel plate manufacturers which was postponed from May will now be held on June 5. While the volume of business that is being closed is exceedingly heavy there is no disposition on the part of the large producers to advance present prices.

PIG IRON.—Despite the fact that consumers of pig iron seem to be pretty well loaded up considerable buying continues and it is not confined to small lots by any means. The largest purchase of the week was made by the American Steel Hoop Co., this concern placing orders for fully 20,000 tons of forge iron for delivery through the second half of the year. A small portion of this tonnage was placed with Northern furnaces at prices ranging from $20.25 to $20.75, Pittsburg, but Southern furnaces captured the greater portion at $15, Birmingham. Sales of Bessemer iron running through the first quarter of next year have also been made at $19.50 to $20 at the furnace which no doubt will form a basis for prices of Bessemer for delivery through the entire first half. It has been reported that the United States Steel Corporation has opened negotiations for Bessemer for delivery through the second quarter of next year, but this is doubted, inasmuch as at least a portion of its proposed increased furnace capacity will be in operation by that time. We also note the sale of 750 tons of No. 2 foundry iron for delivery through the third quarter at $22, Pittsburg, and 1,000 tons of basic at $21, Valley furnace, for early delivery. We revise quotations as follows:

Bessemer, Valley	$19 50 to 21 50
Bessemer, Pittsburg	20 25 to 22 25
No. 1 Foundry	22 25 to 22 50
No. 2 Foundry	21 50 to 22 00
No. 3 Foundry	20 50 to 21 25
Gray Forge, Pittsburg	20 25 to 20 75
Chilled Basic, Valley	20 75 to 21 00
Chilled Basic, Pittsburg	21 50 to 21 75

SELTER.—Prime Western grades are held at 4.35c to 4.40c, Pittsburg. The market is firm and advancing.

STEEL.—There is practically no domestic steel moving and for prompt shipment the nominal quotation is $35 per ton. The demand for foreign steel has also fallen off to some extent. Foreign sheet bars are quoted at $33, Pittsburg, and billets at $32.50. Bessemer rods, domestic, are held at $37 per ton.

FERRO-MANGANESE.—Considerable business is being done in German and French manganese, owing to the limited tonnage that is now being produced at American furnaces. Foreign ferro is sold at $48 to $50 per ton, Pittsburg, while domestic is held nominally at $52.50 for 80 percent delivered at buyer's mill.

MUCK BAR.—Muck iron continues strong and we note the sale of 500 tons for delivery through the third quarter at $35 per ton.

SKELP.—Very little skelp is moving, but prices remain high owing to the high prices of forge iron and steel. Iron skelp is quoted at 2.25c for grooved and sheared and steel is held at 2.15c to 2.20c.

RAILS AND TRACK MATERIAL.—Outside of light rails there is little doing in the rail market and prices remain unchanged as follows: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $45; 12 pounds, $42; 16 pounds, $39; 20 pounds, $37; 25 to 40 pounds, $34 to $36. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—A meeting of the plate manufacturers will be held on June 5, but it is not probable that any change will be made in quotations. A large volume of business is being offered in plates and all the mills are comfortably taken care of with orders. Quotations remain unchanged as follows: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches wide, 5c extra 100 pounds. Plates 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

BARS.—The situation in both iron and steel bars remains practically unchanged. There is considerable small business being taken by all the mills, but practically no heavy buying. We quote as follows: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.70c to 1.80c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras, in 250-tons lots and over, and 2c in less than 250-ton lots; refined iron bars, 2c and upwards.

PIPES AND TUBES.—The volume of business in both merchant pipe and boiler tubes that is being closed daily is very large. Both the National Tube Co. and the independent manufacturers are operating their plants at their utmost capacity. We make the following discounts to jobbers in carload lots, Pittsburg:

MERCHANT PIPE.

	Black. Per cent.	Galv. Per cent
⅛ to ⅜ and 11 to 12 inches	60	48
¼ to 12 inches	67	55

Discounts to consumers in carload lots, Pittsburg, are revised as follows:

BOILER TUBES.

Steel.

	Per cent.
1 to 1½ inches	42½
2¼ to 5 inches	61
1¾ to 2¼ and 6 to 13 inches	55½

Iron.

	Per cent.
1 to 1¼ inches	39
2¼ to 5 inches	48
1¾ to 2¼ and 6 to 13 inches	38

CASING.

	S. and S. Per cent.
2 to 3 inches	58
3¼ to 4 inches	60
4½ to 12½ inches	63

SHEETS.—The demand for the lighter gauges of sheets is falling off somewhat, although the demand for the heavier gauges continues strong. Nearly all the mills are carrying large tonnages on their books which will tide them over a lull of some weeks. Our quotations are as follows: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets, in carload lots to consumers, are quoted at 3.05c for Nos. 10 and 11, 3.45c for Nos. 18 to 21, 4.20c for No. 27, and 4.50c for No. 28. Galvanized sheets, mill shipments in carload lots to consumers are as follows: Nos. 10 and 11, 3.05c; Nos. 12 to 14, 3.15c; Nos. 15 to 17, 3.25c; Nos. 18 to 21, 3.45c; Nos. 22 to 24, 3.75c; Nos. 25 and 26, 4c; No. 27, 4.25c; No. 28, 4.50c.

STRUCTURAL MATERIAL.—The demand for structural material for prompt delivery continues strong and dealers are reaping high prices on small lots. Agreement quotations remain unchanged as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c. Dealers' prices, however, are from $5 to $10 above these quotations for delivery this year.

WIRE AND WIRE NAILS.—There has been considerable falling off in the demand for wire and wire nails during the past few weeks and but for the high prices that many of the independent mills are compelled to pay for their raw material it is believed that present quotations would be shaded. Prices, however, are being maintained as follows: Wire nails in carload lots, $2.05 per keg; smaller lots, $2.10 and $2.15; plain wire, $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire $2.40 in carload lots, polished staples, $2.20, and galvanized staples, $2.60; painted barb wire, $2.60, and galvanized, $2.90. These prices are quoted on a Pittsburg base, plus the actual freight to destination. Cut nails are held at $2.05 in carload lots and $2.10 in less than carload lots, Pittsburg, plus freight to destination.

MERCHANT STEEL.—The volume of new business that is being offered is fair and prices are being well maintained in all lines. We make the following quotations: Turned, cold rolled ground shafting in carload lots is quoted 50 off, and in less

than carload lots, 45 off; tire steel, 1.80c in carload lots and 2c less than carload lots; toe calk, 2.10c to 2.25c; sleigh shoe, 2.10c to 2.25c; machinery steel, 1.70c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

OLD MATERIAL.—Considerable old material has been moving during the week and both iron and steel rails have commanded high prices. We note the sale of 600 tons of iron rails at $27.50 gross ton and 300 tons of relaying rails at $30.50 gross ton. We revise quotations, gross tons, as follows: Car wheels, $21; steel rails, mixed lengths, $21; cast scrap, $18.50 to $18.75; No. 1 wrought, $23 to $23.50; wrought turnings, $13.50 to $14; heavy melting stock, $21 to $21.50.

COKE.—For the week ending Saturday, May 17, the output of the Connellsville region amounted to 246,701 tons, which is the best record made in the region thus far this year. The lower region produced 34,376 tons, bringing the total Connellsville production up to more than 280,000 tons. The output of both regions was fully 25,000 tons greater than that of the previous week and indications are that all records will be broken before many weeks. Furnace coke for spot shipment continues scarce and is held at $2.75, while on contracts $2.50 is quoted. Foundry coke is quoted at $2.75 to $3 according to the delivery. Outside coke is quoted 25 cents below these quotations.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 MONADNOCK BLOCK, May 27.

There is less activity in the pig iron market than for several weeks past, a condition due to the fact that very little iron is now being offered by the furnaces. Practically all the trading done recently was confined to the few Southern furnaces that reopened their books a short time ago for the delivery of iron in the last half; but as these have again withdrawn from the market trade in this particular branch has become almost stagnant. In all lines of finished material, the market gathers increased firmness with each succeeding week. One large manufacturer of agricultural steel announces this week that it is compelled to withdraw from the market on nearly its entire line of products required for shipment between now and July 1, 1903. Consumers are specifying heavily on their contracts and taking all the material they can get in addition. Jobbers report their stocks are depleted almost as rapidly as they are filled, and in many cases the material is not unloaded from the cars but shipped direct to the consumer. Large orders to these come from as far west as the Pacific Coast and also from the Atlantic Coast States. Plates from store have been advanced $3 a ton in the past week, making a total advance of $7 since the mills announced that they would take no further orders for the time being. Steel boiler tubes have also sustained an approximate advance of 5 per cent. Foreign material is freely offered in this market, and several deals in rails, billets and structural steel are reported pending. We note three orders for open-hearth billets which will probably be placed abroad, one for 8,000 tons, another for 4,000 tons and another for 1,000 tons. Many inquiries continue to come from railroads for rails for next year's delivery, but the local mill has not booked any contracts for this shipment. It has sold its stock of seconds, about 10,000 tons, at $27.

PIG IRON.—Little animation is apparent in pig iron, all the Southern furnaces having again withdrawn from the market. Not all these operators have sold their entire product for the last half of the year, though some of them state they are sold up for the third quarter and a few well up to the end of the fourth quarter. Many sellers expect a higher price than $16 Birmingham for No. 2 foundry, will prevail before the end of the year, and are naturally desirous of reserving a part of their tonnage for this higher market. As a proof of this prophecy, they advance the argument that since the Birmingham basis of $16 was established, consumers have been so eager to cover that they have willingly paid $17 for any delivery in the fourth quarter, and $18 for delivery in the third quarter. Outside of a little Northern iron for late delivery, very little material can now be obtained in this market. Some Southern iron that was offered early this month for prompt shipment has all been disposed of at fancy prices. An 18-ton carload of No. 2 foundry was sold last week at $23.15, Chicago delivery; another order of 250 tons of the same grade was sold at $20.30 Birmingham for May delivery; a carload of silvery iron was sold last week at $24.50. Many of the smaller foundries who have hitherto bought their iron on the hand-to-mouth policy, have been compelled to close their shops not being able to pay the present market price and make a profit on their castings. That some of the larger foundries expect a continuance of present conditions for an indefinite period may be taken from the fact that a number of them are placing contracts with a local furnace for next year's delivery. The aggregate tonnage is not yet very large, but inquiries are being received each day, showing that melters are giving the matter serious consideration. We have advanced the price of Lake Superior charcoal $1 a ton, and malleable Bessemer 50 cents a ton. Our quotations follow:

Lake Sup. Charcoal	$23 00 to $24 00	Southern Coke No. 4	$18 65 to $ 9 15
Local Coke Fdy. No. 1	22 00 to 22 50	Southern No. 1 Soft	20 65 to 21 65
Local Coke Fdy. No 2	21 00 to 21 50	Southern No. 2 Soft	19 65 to 20 65
Local Coke Fdy. No. 3	20 00 to 20 50	Southern Gray Forge	16 90 to 17 90
Local ScotchFdy.No.1	21 00 to 21 50	Southern Silveries	18 25 to 19 65
Local ScotchFdy.No.2	20 50 to 21 00	Jackson Co. Silveries	23 10 to 23 [illegible]
Southern Coke No. 1	20 65 to 21 65	Ohio StrongSofteners	23 10 to 23 60
Southern Coke No. 2	19 65 to 20 65	Alabama Car Wheel	23 6[illegible] to [illegible]4 15
Southern Coke No. 3	19 15 to 20 15	Malleable Bessemer	22 00 to 22 50

BARS.—There is little new in this material. Orders are fairly plentiful for both iron and steel. One manufacturer reports an order for 3,000 tons of steel for deliveries extending through the year. The most hopeful sign of this branch of the trade is the heavy specifications coming in from all classes of consumers. We quote Chicago delivery: Soft Bessemer steel, 1.75c to 1.85c; angles, less than 3x3, 1.85c; iron 1.85c to 1.95c; hoops, 2.15c. Prices out of store, steel, 2c to 2.10c; iron, 2.15c to 2.25c; hoops, 2.40c to 2.45c; angles, 2.50c to 2.60c.

SHEETS.—A continued fair business is reported by both mills and jobbers. We quote No. 27 black, mill shipments, Chicago delivery, 3.15c to 3.25c; galvanized, 4.40c to 4.50c; out of store, No. 27 black, 3.45c to 3.55c; galvanized, 4.70c to 4.80c.

STRUCTURAL STEEL.—There is still an exceedingly active demand for all sizes and shapes for prompt shipment, which local yards are endeavoring to the best of their ability to fill. Orders for shipment next year continue to come in to the local offices of Eastern mills, who report that the inquiry grows each week. We quote mill prices as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; structural angles, 3x3 to 6x6, 1.85c; angles, channels and tees, smaller than 3 inches, 1.85c base; plates, 1.75c. Prices on lots from store are based on the necessities of buyers and according to the size of order. Mills are sold up for the entire year, and consumers in immediate need of material must go to jobbers for the same or buy abroad. Store prices vary from 2½ to 4 cents a pound.

BILLETS.—Foreign billets are being offered quite freely in this market, and three orders for open-hearth billets will probably be placed abroad. One of these is for 8,000 to 10,000 tons, another for 4,000 tons, and another for 1,000 tons. Each of these orders, it is stated, was first offered to American mills, but was declined since the price and delivery could not be made satisfactory. We quote domestic Bessemer billets, $36 to $38; open-hearth, $38 to $40.

RAILS AND TRACK SUPPLIES.—The local interest reports that it has sold its entire stock of seconds, amounting to about 10,000 tons, disposing of the same on the basis of $27 a ton. Railroads continue to make inquiry for the delivery of standard sections next year, though no contracts have yet been closed. Light rails and track supplies are in active demand, but very scarce. Some orders for the former material, it is reported, are being placed abroad. We quote standard sections, $28; light rails, 45 pounds, $33; 12 pounds, $40 with regular differentials for intermediate sizes; out of store, $45 to $50; splice bars, 2c; spikes, carload lots, 2.35c to 2.50c; track bolts and hexagon nuts, 3.10c to 3.25c; out of store, 3.50c; square nuts, 2.95c base; out of store, 3.10c.

MERCHANT STEEL.—One large manufacturer in this field has been forced to withdraw from the market on material wanted for shipment up to July 1, 1903, and has had to decline several good-sized contracts for carriage tire owing to its capacity for this period being taken. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c; open-hearth spring steel, 2.65c to 2.75c; sleigh shoe, 1.75c to 1.80c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base;

plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 percent to 10 percent higher; cold rolled shafting, carload lots, 50 percent off, Chicago; less than carload lots, 45 percent off, Chicago.

CAST IRON PIPE.—New business is of fair proportions and deliveries cannot be made on the larger sizes for two or three months ahead. We quote 4-inch water pipe, $31, carload lots, f. o. b. Chicago; 6-inch water pipe and larger sizes, $29 to $30; gas pipe, $1 a ton higher than these prices.

MERCHANT PIPE.—Jobbers have made an approximate advance of 5 percent in the larger sizes of boiler tubes, as the result of an advance made by the mills. Business is fairly active in both pipe and tubes, and prompt delivery of material can be promised. We quote as follows:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
⅛ to ⅜ in.	56¼	44½
¼ to 12 in.	63½	51½

BOILER TUBES.

Steel.

	Per cent.
to 1¼ in.	35
1¼ to 2½ in.	45
1½ to 5 in.	55
6 to 13 in.	47½

Iron.

	Per cent
1¼ in.	35
1¼ to 2¼ in.	32¼
2½ in.	35
2¼ to 5 in.	42½

PLATES.—Jobbers have again advanced store prices $3 a ton, making a total advance of $7 over mill prices since manufacturers announced they had withdrawn from the market. Orders are quite plentiful, coming from as far west as the Pacific Coast and from Maine and Connecticut in the East. Mill prices are unchanged. We quote Chicago delivery, tank steel, base, ¼-inch, 1.75c; flange steel, 1.85c. Jobbers' prices on mill orders, tank steel, base, ¼-inch, 2.15c to 2.25c; flange steel, 2.25c to 2.35c; out of store, tank steel, ¼-inch, 2.25c to 2.35c; 3 1-6, 2.35c to 2.45c; No. 8, 2.45c to 2.55c; flange steel, 2.60c.

WIRE AND WIRE NAILS.—There is no diminution in the volume of business for all kinds of materials. We quote as follows: Smooth wire, carloads, $2.15; painted barb wire, $2.75; galvanized barb wire in carload lots, $3.05; wire nails, carload lots, $2.20; staples, carload lots, $2.30; jobbers' prices to retailers, 10 cents higher than above for carload lots, and 20 cents higher for less than carload lots.

COKE.—The coal strike has not as yet affected either the shipments or the price of coke in this market. We quote standard 72-hour Connellsville foundry, $5.25 to $5.50; Virginia and West Virginia coke, $5 to $5.25.

OLD MATERIAL.—The price of scrap still holds its own, though very little buying is being done by mills. We quote gross tons as follows:

Old iron rails	$24 00 to $25 00	Old steel rails, mixed	$16 0 to $ 6 50
Old steel rails, 5 ft. and up	22 00 to 23 00	Relaying rails	27 00 to 28 00
Old steel rails, 3 ft. and under	17 00 to 18 00	Old wheels	19 00 to 19 50
		Heavy melting steel	15 50 to 16 00
		Mixed country steel	13 0 to 14 00

The following are selling prices per net ton:

No. 1 R. R. wrought	$19 50 to $20 00	Steel axles	$19 00 to $19 50
No. 2 R. R. wrought	18 00 to 18 50	Cast borings	0 00 to 9 50
Dealers' forge	15 50 to 16 00	Wrought turnings	13 00 to 13 50
No. 1 busheling	13 50 to 14 00	Iron axle turnings	14 00 to 14 50
No. 1 R.R. & mch. cast	14 25 to 14 75	Steel axle turnings	13 50 to 14 00
Railway Malleable	15 00 to 15 50	Stove plates	10 50 to 11 00
Country malleable	13 00 to 14 00	Old iron splice bars	21 00 to 21 50
Iron axles	24 50 to 25 00		

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, May 28.

Delays to boats engaged in the transportation of iron ore continue to be a factor in the market. It is estimated that so far they have resulted in "killing" one-third of the tonnage engaged in carrying iron ore, and this is having its natural effect upon the movement of material down the lakes. Receipts at the lower lake docks have been considerably below the original estimates for this month and it is hardly believed that the movement will be anywhere near the 4,000,000-ton mark aimed at. The shippers and others interested have come to conclude that the shortage of cars at the lower lake ports is directly responsible for the delays and the consequent shrinkage in the movement. Rates are staple perforce since not enough boats are escaping the general blockade at unloading ports to permit a break, however much shippers may be inclined that way. Wild cargoes are placed at 75 cents from Duluth to Ohio, other ports being scaled accordingly.

PIG IRON.—Consumers seem to be using all the iron they can get and continue to buy all that the market presents. The point has also about been reached where the price is not seriously regarded by those who need material. In foundry grades sales of small amounts have been made during the week at $21, Valley furnace, for No. 2. Some of the furnaces find that they will have more iron to dispose of during the third quarter than has been anticipated. The price quoted above applies also on the advance sales. Southern iron is quoted at $17, Birmingham, to which is added a $3.70 freight to Cleveland. Some small sales of Bessemer have been reported during the week at $21.75 in the Valleys, although the amount of material for disposition is by no means large. The one thing which overshadows the market is the prospect of a curtailment of production in the Valleys because of the impending strike of the furnace workmen. It was learned from a Youngstown source last night that the men have determined to strike June 1 and have said that a compromise is not acceptable. The dominating fact in the case and the thing that makes the men's demand untenable is that men cannot be had to operate the furnaces on eight-hour shifts. While the organizers have been busy in the Pittsburg, Southern Ohio and Cleveland districts, their progress has not been sufficient to warrant the belief that many, if any, of the furnaces in these districts will be closed down.

Bessemer	$20 50 to $21 50	Scotch No. 1	$21 75 to $22 75
No. 1 Strong F'dry	21 75 to 22 75	Scotch No. 2	21 00 to 23 00
No. 2 Strong F'dry	21 00 to 22 0c	Gray forge, Valley	18 50 to 19 00
No. 3 Foundry	19 75 to 20 25	LakeSuperior charc'l	22 00 to 23 00

FINISHED MATERIAL.—It is learned that a considerable amount of steel will be imported to the Cleveland district shortly. This includes, among other things, structural steel for which there has been a very great need in certain quarters. Some ship orders have been made possible by this movement, and the completion of other projects which are under way. The importations also include sheet bars. The demand for structural steel continues very heavy and the buying into next year is still a feature. One order for delivery during the first quarter of next year was for 800 tons, the old price of 1.70c, Cleveland, prevailing. Some of the Eastern mills have discovered some uncovered capacity for third quarter delivery and are selling their stock out at store prices getting for it from 2½ to 3c, to which basis the store quotations have been advanced of late. The jobbers are encountering such demands as make the collection of any stock impracticable. The plate trade has been more active also and the jobbers are reporting that sales are being made fast enough to take up all of the material they have at their disposal on old contracts. The general shortage of steel is preventing any great amount of material from finding its way to the open market. The quotation has now been advanced by all mills having plates to offer to the 1.80c Cleveland basis. In plates, as well as in other material, there is evidence that some business paying premiums for prompt delivery is being worked in by mills. The light rail trade, particularly in 16-pound sections, has shown great activity during the past week and quotations for 16-pound rails have now reached $30 at the mills, with no immediate change indicated, unless it should be to a higher plane of prices. An expected increase in the light rail capacity had a certain effect upon the market for a short time, but when it was learned that the mill would have to retire for the time being because of poor working prices stiffened some. A sale of 800 tons of standard section rails for July delivery at $28 was also recorded during the week, one of the larger mills discovering that an order of that size could be worked in. Black sheets are in fair demand but the mills do not seem to be getting orders much ahead of their capacity. In heavy sheets the activity is more pronounced. Sheet prices do not change from the 2.50c quotation for No. 10, being the basis for the gauges betwen 10 and 16, and 3.50c for No. 27 being the basis for the guages between 17 and 28.

OLD MATERIAL.—There is a growing demand for mill scrap and some of the dealers are finding it difficult to get the material which the mills require. There is a fair demand also for foundry scrap. The market is strong, particularly for iron rails and steel melting stock at prices which have prevailed hitherto. We continue the quotations as follows, all gross tons:

Old iron rails	$ 24 00 to 26 00
Old steel rails (6 ft. and over)	21 00 to 23 00
Old steel rails (6 ft. and under)	17 00 to 19 00
Old car wheels	18 00 to 19 00
No. 1 R. R. wrought scrap	21 00 to 22 00
Mill scrap	17 00 to 18 50
No. 1 machine cast scrap	15 00 to 16 00
Iron axles	26 00 to 28 00
Axle turnings	16 00 to 17 00
Wrought turnings (free from cast)	13 50 to 14 00
Cast borings	9 00 to 10 00
Uncut wrought iron boilers	11 00 to 13 00
Steel boiler plates	16 00 to 17 00
Grate bars	11 00 to 12 00
Pipes and flues (clean)	17 00 to 18 00
Tank iron	17 00 to 18 00
Hoop and band iron	13 00 to 14 00
Sheet iron	11 00 to 12 00
Wrought drillings	13 00 to 13 50
Malleable iron	17 00 to 18 00
Stove plate	12 50 to 13 50
Heavy steel	17 50 to 18 50

CINCINNATI.

May 28.

It has been the occasion of remark in the local iron trade that the two lines that have shown the greatest strength in the past few weeks have been iron and lumber. Building operations are more extensive than they have been any spring season in years. There is a good demand for lumber even at higher prices, just as there is a continued activity in the iron trade also in the face of high prices. The parallel between the two is significant. The past week has shown continued strength in all branches in the iron market, a possible exception being the market for scrap iron, which has been influenced to some extent at least by the rather meager offerings of railroad scrap. The demand for finished material has been excellent and this applies to all kinds—from structural material to bar iron or specialties that are used by manufacturers of various products. Machinery manufacturers report a heavy demand for everything that they make, and a good feature is that this business comes from sections of the country that have not heretofore been as active in buying as others.

Pig Iron.—The pig iron market has been quieter this week than for some time, rather because there has been little iron offered than that the demand has fallen off. As a matter of fact the demand is not as heavy as a few weeks ago. The large Southern producers came into the market with additional offerings at just the right time to allow consumers to cover for the better part of the rest of the year. Yet, it is said by pig iron handlers and agents that the demand is amply sufficient to consume much more iron than is offering at the present time. Sales of pig iron have been confined largely to foundry grades. The lots traded in have ranged from 1,000 tons downward and prices have been mainly at $16 for No. 2 Birmingham. Some sales for delivery in June and July are reported as high as $17 to $17.50. The large Southern producers that came into the market about a month ago with such iron as they had to offer for the remainder of the year have now practically sold up that amount. These sales have materially relieved the necessity of many consumers, but it is evident that the producers are now almost at the end of their string as far as the year 1902 is concerned. Indeed, one of the large Southern furnace companies has already withdrawn from the market again and the other is scaling down its acceptances. One case is cited of an order for 400 tons of foundry iron sent to one of these large companies and the acceptance was for but 200 tons.

There have been some importations during the fortnight, and a large Cincinnati pig iron firm has just brought over 3,000 tons of Scotch iron. Of course, all of this iron stays in the East. The prices quoted for Cincinnati market last week hold for this week as well, as follows:

Southern Fdy. No. 1		$19 25 to 20 25	Gray Forge		$17 75 to 18 25
"	"	2 18 75 to 19 75	Northern Fdy. No. 1		22 00 to 23 00
"	"	3 18 25 to 19 25	"	2	21 00 to 22 00
"	"	4 17 75 to 18 75	Southern C. W. iron		23 75 to 24 75
So. Fdy. No. 1 soft		19 25 to 20 25	Malleable coke iron		22 00 to 22 75
So. Fdy. No. 2 soft		18 75 to 19 75			

Finished Material.—There has been no change in the market for finished material. The demand is good and deliveries are still by no means satisfactory. Building operations are going ahead with unusual activity and structural iron concerns are finding an ever widening market. The demand for bars is steady and not affected by any change or contemplated change in the market. Bar iron remains at 1.92c and bar steel at 1.72c, both iron and steel bars being quoted at 2.20c out of store. Angles are 2.35c and 2.50c out of store. Sheets are quoted at 2.50c for No. 12 and 2.35c for No. 10.

Old Material.—Dealers in scrap iron report the market rather quiet. They say that this is due more to the fact that offerings are not large than to the fact that they are unable to sell what they have. Railroad scrap is in good demand but is not plentiful. Other kinds are unchanged both as to movement and price. The following quotations maintain for the Cincinnati market:

Old No 1. Wrought Railroad, net tons	$ 19 50 to 20 00
Cast Machine and Foundry, net tons	14 00 to 14 25
Old Iron Rails, gross tons	25 00
Old Steel Rails, gross tons	24 50 to 24 75
Old Short Lengths, gross tons	17 50 to 18 00
Old Iron Axles, gross tons	25 00
Old Iron Car Wheels, gross tons	19 00 to 19 50
Stove Plates, gross tons	11 00 to 11 25
Wrought Turnings, net tons	14 00
Cast Borings, net tons	8 50 to 8 75

PHILADELPHIA.

May 27.

Curtailment of production if not actual suspension confronts the furnaces owing to insufficient coke supplies to take the place of anthracite coal. This makes the situation all the more perplexing and in the face of the greatest demand it is, to say the least, unfortunate that anything should occur to hamper the efforts being made to meet it. Running along from day to day with scant supplies the melters are in a difficult position and although they eagerly pick up any melting stock which they at other times would not accept, they are seriously handicapped and temporary shut-downs are common.

The expected relief through better shipping facilities has not come because there are no stocks at the furnaces, the iron being shipped as fast as it is made. The extent to which importations have been arranged for is not known but where deliveries can be guaranteed, sales are readily made at full prices.

Pig Iron.—A considerable volume of foreign iron is finding its way to the Atlantic seaboard owing to favorable freight rates. Most transactions cover only small lots of iron with deliveries running through the balance of the year. Sellers are showing an inclination to hold out for rather stiff prices during this period, the difference between June and July figures and those quoted for the last quarter amounting to only seventy-five cents or a dollar a ton. In view of the uncertainty prevailing in regard to the future buyers seem to think that their position can not be materially weakened by going slow. It is to be remembered that much the greater part of the iron being melted today is being delivered a much lower prices than are now being asked, having been contracted for months ago. While prices are hardly quotable the following is believed to be a fair average of transactions covering the last half of the year: No. 1 X foundry, $21 to $22; No. 2 X foundry, $20 to $20.50; No. 2 plain, $19.50 to $20; standard gray forge, $18.75 to $19.50; ordinary gray forge, $18.25 to $18.50; basic, $19.25 to $19.75. Where iron can be secured within 30 to 60 days, higher values prevail depending upon local circumstances.

Finished Material.—Delays in the arrival of structural material contracted for abroad have been somewhat disappointing and the quality of several shipments that have come to hand has not been exactly first class. In bars the continued labor troubles at mills in Eastern Pennsylvania makes the scarcity greater. The plate mills have more business than they can handle and it is extremely difficult to secure deliveries within 90 days. The range of prices for city and nearby deliveries is about as follows: Plates ¼-inch and thicker, 2c to 2.10c; steel bars, 1.85c to 1.95c; iron bars 2c to 2.05c; beams and channels, 1.90c to 2.10c; angles, 2c to 2.50c.

Old Material.—In view of the high prices of pig iron holders are inclined to sell only at full figures, contending that general conditions warrant these. Bids and offers are about as follows for deliveries buyers' yards: Choice railroad scrap, $24 to $25; ordinary light scrap, $16 to $17; machinery cast, $18 to $18.50; heavy steel scrap, $21 to $22; old iron rails, $25 to $26; wrought turnings, $16 to $17; cast borings, $10 to $10.50; old iron axles, $26.50 to $28; old steel axles, $25 to $26; old car wheels, $19.50 to $20.50.

The American Sheet Steel Co. has begun dismantling the planished sheet steel plant operated in connection with the Falcon plant at Niles, O. The Falcon plant has also been closed for an indefinite period and may also be dismantled.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

PUBLISHED EVERY THURSDAY BY

THE IRON & STEEL PRESS CO.,

ROSE BUILDING, CLEVELAND, OHIO.

G. H. GARDNER, President and Treasurer.
JOHN A. PENTON, Vice-President.
A. I. FINDLEY, Secretary.

A. I. FINDLEY, - - - - - - - - - - - EDITOR.
ROBERT I. CLEGG, - - EDITOR MACHINERY DEPARTMENT.

CHICAGO: 519 Monadnock Block, GEO. H. GRIFFITHS, Manager.
PITTSBURG: 429 Park Building, A. O. BACKERT, Manager.
NEW YORK: 150 Nassau St., D. C. WARREN, Manager.
THE CENTRAL WEST: R. A. EVANS, Manager.

Subscription, $3.00 per annum. To Foreign Countries, $4.00.
Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

MAY 29, 1902.

CONTRACT-BREAKING BY LABOR UNIONS.

The strike of the anthracite coal miners of Pennsylvania has brought forward again the question of contract-keeping by labor unions. If the bituminous miners are called from their work an effective weapon will be put into the hands of the anthracite workers, for if they can prevent the substitution of soft coal for anthracite the gravity of the situation will be more promptly impressed upon consumers and sentiment favorable to a compromise will be the more quickly created. But in advance of any action by the bituminous miners the answer to such a proposal is made for them in the published statement that the bituminous miners are under contracts having in many cases eleven months to run, and therefore cannot strike. The most prominent member, probably, of the National Civic Federation's conciliation committee, with a confidence born of recent intimate association with labor leaders, declares that the contracts of the bituminous coal miners will be regarded.

President Mitchell has put emphasis in his magazine articles and other public utterances upon the contract-keeping characteristics of the miners' union. He has asserted that the keeping of contracts even at a temporary sacrifice was the only course unions could think of adopting, if they expected to make any headway in collective bargaining or in maintaining a footing of conciliation and conference with employing corporations and associations of employers. Yet in response to newspaper questions some of the officers of bituminous miners' unions have merely said that the question of striking to aid the anthracite miners had not come up formally as yet. There was no statement that contracts existed and therefore that the thought of a sympathy strike could not be entertained.

The International Association of Machinists, in its strike last year, made no discrimination between members of the National Metal Trades Association and non-members, though it was bound by agreement with that association to keep its men at work in the shops of members pending the adjustment of any wage demand through conference or arbitration.

The Amalgamated Association of Iron and Steel Workers, in its strike last year, took the position, in the demand of its executives that the men in South Chicago, Joliet and Bay View mills go out to support the strike, that orders from union officers are to supersede all contracts with employers. In other words, agreements made with the express design of insuring steady operation and of protecting workmen against lockouts and reductions, and employers against strikes and peremptory demands for advances, are binding only so long as the officers of the employes' union choose.

These conspicuous instances show at least that the labor union movement, while, as well illustrated in the case of the Amalgamated Association, it has developed the making of wage contracts into a fine art, has not yet reached the point where the signatures of union officers on an agreement give it the validiy that the law attaches to contracts between man and man.

It is the faith-breaking and law-breaking records many of the unions have made—though there are conspicuous instances to the contrary—that have strongly prejudiced them in the public mind. Manufacturers who are in the habit of keeping agreements they make are unwilling to tie themselves up with contracts that hold them, while the other contracting party considers the compact terminable whenever its interest seems larger in breaking than in keeping faith.

It is not surprising that this attitude toward contracts, and the attitude commonly assumed toward law and order in case of strikes, should breed insubordination within the ranks of the men's own organizations. Strikes in disregard of the order of union officers are the outcropping of the same lawless spirit. The radical element in every union, usually composed largely of new recruits, is restless under restraint and obedience seems not to belong to its vocabulary. In a late issue of the *Iron Molders' Journal* the editor discusses at length this serious phase of recent history in that organization. The Chicago molders' strike is a case in point. The writer says:

> Since the Indianapolis convention there have been several instances in which local unions have deliberately refused to abide by the decision of the men whom the organization has vested with responsibility for the conduct of the organization's affairs. They have set themselves up against the judgment of those who, by reason of their intimate knowledge of the general situation and their ability to view the whole field of effort, were better able to determine the best policy to be pursued. In several instances locals, dissatisfied with the decision, have inaugurated a general strike of their members, independent of the National union; but in no single instance that we can recall, have they achieved complete success. In every case, the recalcitrant locals have either suffered defeat or received such wounds as it will take long years of patient effort and hard work to heal. That statement is no exaggeration and will bear investigation. We might go further and say that invariably the "independents," realizing their weakness after a few weeks of conflict, have been found appealing for assistance to the very authority they had so recently defied "that their organization might be preserved."

The editorial truly says that the worst feature of such insubordination is the injury done the organization, and adds: "A contract is only valuable when the contracting parties have confidence in each other's ability to carry out their part of the obligation. If a national trades union has not perfect control over the actions of the local unions which compose it, it ceases to be a responsible party in the eyes of the business world, and its prestige suffers immeasurably." It concludes by advocating such a change in the by-laws of the molders' union as shall make the punishment for entering upon a strike against the will of the executive board punishable with nothing less than expulsion from the union.

In commending the strong stand taken in this article against destructive radicalism we do not forget that there are obligations resting upon manufacturers who have allied themselves together the better to handle the questions growing out of modern shop conditions. Every failure to keep the spirit of an agreement with organized labor will bring a plentiful crop of retalia-

tion. Neither side can justify contract-breaking by citing an individual failure on the other side to carry out an agreement. But as matters stand the cases of wholesale repudiation of agreements by labor unions are so conspicuous and so indefensible as to make instances of like nature chargeable to employers trivial by comparison. The well-knokn irresponsibility of orgnaized labor before the civil law has made its delinquencies easy, and beyond the reach of penalty. Yet there are some indications of a growth of sentiment on the side of faith-keeping. In the case of the Iron Molders' Union the coming Toronto convention and its action on the Chicago strike will give proof whether the movement in that organization is forward or retrograde.

INCREASING IMPORTS OF IRON AND STEEL.

The Treasury Department statistical summary issued this week and covering our import and export movement for the month of April shows a decided increase in our imports of iron and steel, especially in the cruder forms. Still, it must be admitted that the figures do not bear out all the reports of purchases abroad. The movement is still a comparatively small one. The total tonnage of those lines in which weights are reported was only 46,017 tons in the month of April, and while this is more than three times the imports in April of last year it is not a heavy total.

Imports of crude steel, including ingots, blooms, slabs, billets and tin plate and sheet bars, amounted in April to 11,986 tons, against 6,569 tons in March, 2,235 tons in February and 5,313 tons in January. The total for the first four months of the year is only some 26,000 tons or 260 tons for each working day. Such imports cannot supplement to any great extent the product of our large steel works, many of which turn out some ten times as much each. Contracts already placed in Germany would call for a considerably heavier tonnage than has been coming in so far, not counting the imports from the Dominion Iron & Steel Co., which in April cut a considerable figure, amounting to some 3,000 tons. It is doubtful if all the steel purchased abroad will actually be imported. Some interests well posted in such matters assert that it will not, but that many contracts will be cancelled. Time will tell this. It is certain that it is increasingly difficult to find vessel room for such freight. It should be noted that the figures for ingots, slabs, billets, etc., include also bars of steel and "steel in forms not elsewhere specified." This would include Swedish bars, also foreign structural material, in which a beginning of importations has been made, though it cannot be told from the statistics as given whether any came in in April.

Turning to other import items, we find that pig iron imports increased from 17,184 tons in March to 19,067 tons in April, a considerable percentage being ferromanganese and spiegel. The imports in the same months of last year were almost negligible, being only about 5,500 tons for March and April. The figures for ten-month periods emphasize the increase, the ten months ending April, 1901, showing up only 28,395 tons, against 95,795 tons in the same period ending with April last.

A heavy increase in tin plate imports is observed in the table—44,022 tons in the ten months ending with April, 1901, against 76,640 tons in the same period ending April last. This is the more remarkable when it is borne in mind that the great bulk of such imports are intended for re-export under the drawback provisions. The imports of tin plate due to the strike were not of great volume as the foreign market price, plus freight and duty has all along been very much above the mill price in the United States. Only at the period of the greatest scarcity of spot plates last fall did it pay to import plates. The indication therefore is that there has been an important increase in our exports of domestic goods such as oil, fish, fruit, meat, etc., packed in tin packages. The drawback statistics for the current fiscal year will indicate the exact scope of this movement.

The total value of our iron and steel imports in April last was $2,379,892, against $1,354,543 in the previous April. The value for the ten months ending with April last was $20,280,964, against a similar total of $14,851,358 a year previous. This does not include iron ore, in which there was a heavy increase in the same period, from 577,676 tons to 944,218 tons. The tabulated statement follows:

IMPORTS OF IRON AND STEEL TO THE UNITED STATES—GROSS TONS.

	April.		9 Mos. end'g Apr.	
	1901	1902	1901	1902
Pig iron	3 335	19,067	28,395	95.795
Scrap	3.743	5.519	17,769	24,660
Bar iron	991	1,00	14,814	20, 10
Rails	330	673	973	3.935
Hoop, band or scroll	3	130	130	3.6'7
Steel ingots, slabs, billets and b rs	436	11,986	7.493	30 455
Sheets and plates	145	538	1 528	7,004
Tin and terne plates	3.491	5 436	44 072	76 6,0
Wire rods	1,057	1,393	14,641	12,646
Wire and wire articles	319	465	2.359	3,656
Total	13,753	46,017	132,193	278,586

Our exports have declined materially in most lines, comparing last April with April of 1901. Wire, however, shows an increase, as it has right along, and as wire is one of our heavy lines of export this is significant. The exports in April were 10,508 gross tons, against 8,171 gross tons in April, 1901. Comparing the ten-month periods, there was an increase from 59,807 tons to 79,684 tons. Wire and wire products are the cheapest of all finished lines at the present time, and the low price in the domestic market and the heavy exports explain each other very well, the fundamental cause being a decided excess in wire making capacity over all possible domestic demand. There was an increase in exports of structural material, doubtless largely as parts of bridge trusses, from 4,478 tons in April, 1901, to 4,755 tons, and for the ten-month period, from 53,144 tons to 55,826 tons. Pig iron fell off from 5,695 tons to 1,570 tons for April and from 251,068 tons to 50,940 tons for the ten months; steel rails, from 41,389 tons to 4,501 tons for April, and from 299,643 tons to 151,278 tons for the ten-month periods.

The total value of all our exports of iron and steel, including machinery, hardware, etc., was $9,320,633 in April, against $9,081,223 in April, 1901, showing a slight gain due to heavier exports of some machinery lines, also to important advances in prices of iron and steel. Comparing the ten-month periods, however, there was a decline from $99,228,228 to $82,388,463.

Personal.

John Fritz, of Bethlehem, Pa., the Nestor of the American iron trade, left Liverpool for New York, on Wednesday, May 14. He was accompanied to the ship by several of his friends, including Axel Sahlin, the general manager of the Millom & Askam Iron Co., whose wife is a niece of Mr. Fritz.—[London Iron and Coal Trades Review.

A Youngstown, O., dispatch says that Wm. H. Baldwin, who retired as secretary of the National Steel Co. last year, and has since been absent in Europe, has given the officers of the Youngstown Free Kindergarten Association $25,000 for the erection of a building and the extension of their work.

Assistant Superintendent E. F. Wood, of the Homestead, Pa., plant of the Carnegie Steel Co., has resigned and has been succeeded by H. D. Williams, formerly superintendent of the 28 and 38-inch blooming mills. Mr. Wood was with the Carnegie Steel Co. for 18 years and is considered one of the brightest steel experts in the country. G. E. Weisner succeeds Mr. Williams.

Clarence M. Mendenhall, who recently resigned as superintendent of motive power of the Chicago & Alton railroad, has been appointed assistant to the manager of the Pressed Steel Car Co., of Pittsburg.

AMALGAMATED ASSOCIATION'S GAINS IN THE EAST.

(Special Telegram.)

PITTSBURG, May 28.—The Amalgamated Association of Iron, Steel and Tin Plate Workers is about to increase its membership largely by the addition of a number of lodges in the Central and Eastern sections of this State which are now affiliated with the American Federation of Labor. On Saturday a convention will be held at Reading, Pa., at which delegates will be present from these lodges and it is probable that they will be taken into the association at that time. Among the mills to be included are five at Lebanon, Pa., four at Columbia, Pa., three at Pottstown and one each at Reading and Birdsboro. Since the steel strike of last summer was settled lodges were organized as follows: One at Reading, Pa.; four at Scranton, Pa.; one at Douglassville, Pa., and one at New Haven, Conn. This gives the association a greater membership in the East than ever before in its history.

The strike of the puddlers in the Eastern part of the State now involves eleven plants, of the following companies: American Iron & Steel Mfg. Co.'s East, Central and West works at Lebanon, and Reading works at Reading; the Lebanon Rolling Mill Co.'s one works at Lebanon; West End Rolling Mill Co.'s one works at Lebanon; Penn Iron Co.'s works at Lancaster; Susquehanna Iron & Steel Co.'s Columbia, East End, Susquehanna and Union mills at Columbia. The employes of the Potts Bros. Iron Co., Ltd., operating the Pottsgrove works at Pottstown; the Glasgow Iron Co., operating the Pottstown Iron Works at Pottstown, and the Birdsboro works at Birdsboro, are members of the American Federation of Labor, but are not on strike, as the terms have been conceded.

Worcester Machinists' Strike.

(Special Telegram.)

WORCESTER, Mass., May 28.—The machinists' strike in Worcester for 10 hours' pay and a nine-hour day does not have the general support of the workmen. No shop is shut down. Prentice Brothers are probably the most seriously inconvenienced. The present difficulty is not comparable with the situation of last year, however. About 275 men went out in all. The 40 shops of the city are all members of the Worcester Metal Trades Association and the employers have agreed not to employ the men who left their work. The F. E. Reed Co. and the H. C. Fish Machine Works, in addition to Prentice Brothers, are the only shops affected.

The Williams Tool Co., organized in Erie, Pa., a short time ago for the manufacture of pipe threading and bolt cutting machinery, special tools, etc., has just completed a one-story brick structure, 50x135 feet at the corner of 12th and Poplar Sts. The provisions for plenty of light and ventilation are features of the building. The equipment is now being installed, and it is expected to begin operations some time in the latter part of June. The officers are: R. T. McClure, president; John Jorden, Jr., vice president; John A. Lang, secretary and treasurer; and J. C. Williams, manager. Mr. Lang was formerly secretary and treasurer of the Downey Mfg. Co., of Erie. Mr. Williams was for 21 years foreman of the tool shop at the Jarecki Mfg. Co., Erie, Pa., and for ten years with the Stockwell Screw & Machine Works Co., of Cleveland.

The Lake City Engineering Co., of Erie, Pa., are furnishing the Consolidated Ice Refrigerating & Machine Co., of Punta Gorda, Fla., with a large dredging outfit consisting of five carloads, two of which will go forward in a few days.

Westerman & Co., of Lockport, N. Y., manufacturers of horseshoe iron, and of rounds, squares, hexagons and fancy shapes, with an annual capacity of 6,000 tons, are now operating their rolling mill to its fullest capacity. They manufacture high grade iron, almost exclusively working for the leading set screw makers in the United States and Canada. They have a large trade in all the cities in which their special lines of iron are required.

Mabel Furnace, Sharpsville, Pa., goes out of blast this week for relining.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

(Special Telegram.)

BOSTON, May 28.—The Boston meeting of the American Society of Mechanical Engineers began with a reception on Tuesday evening which was very successful, the inclement weather not preventing an unusual attendance of members and guests. So far the total of names registered has reached 489 and with holiday conditions later in the week a record breaking meeting is assured. The opening session was called to order by Francis H. Boyer, Somerville, Mass., who as chairman of the local committee tendered the hospitality of Boston members to the visitors and then introduced the various speakers. Dr. Henry S. Pritchett, president of the Massachusetts Institute of Technology, welcomed the visiting delegation in an able address, reciting the modern achievements of the engineer and his present and assured supremacy in the progress of the world. The speech was warmly received and the felicitous combination of scholarly wit and wisdom was keenly appreciated.

The president of the oldest engineering society in America, George A. Kimball, of the Boston Society of Civil Engineers, presented the greeting of a sister organization, alluded to the work of Reynolds, Leavitt and others in engineering exploits in Boston, and touched upon the close relationship of mechanical and civil engineers. The illness of President Edwin Reynolds prevented his presence and Vice President James M. Dodge, of the Dodge Mfg. Co., responded to the addresses of welcome. The remainder of the evening was devoted to an informal reception, followed by a collation.

Sharon Steel Company.

(Special Telegram.)

PITTSBURG, May 28.—A meeting of the stockholders of the Sharon Steel Co., of Sharon, Pa., will be held in August for the purpose of voting upon an increase in the capital from $5,000,000 to $6,000,000. The pipe and sheet mill departments will be placed in operation early in August and four additional open-hearth furnaces will be started early in September.

The West Carnegie Sheet Steel Co., of Pittsburg, last week awarded contracts for the erection of its plant at West Carnegie, Pa. The contract for two 25-ton basic open-hearth furnaces was awarded to E. E. Erikson, of Pittsburg. The contract for the blooming and sheet bar mill, six sheet mills and two stands of cold rolls was awarded to the Gruson Iron Works, of Philadelphia. The blooming and sheet bar mill will consist of two stands of three-high rolls 24 inches in diameter. These stands will be driven by a 30x60-inch Hamilton-Corliss engine, made by the Hooven, Owens & Rentschler Co., Hamilton, O. The sheet mill proper will be of six mills, one 44-inch, four 38-inch and one 32-inch. These include two cold mills. The power will be furnished by a pair of Hamilton-Corliss engines, 34x72 inches, also made by the Hooven, Owens & Rentschler Co. The engines will be placed side by side, each driving a train composed of three hot mills, with a cold mill at the end. Steam will be furnished by 1,500 horsepower of water tube boilers, made by the Erie City Iron Works, Erie, Pa. The main building will be 340 feet long and 140 feet wide, the contract for which has been awarded the Fort Pitt Bridge Co. The annual capacity of the plant will be 12,000 tons of sheets. Officers will be elected the latter part of this week as follows: D. R. Torrance, president; John F. Steel, vice president; W. H. Skivington, secretary, and G. C. Brown, mill superintendent.

The furnace and ore-handling plants of the Tonawanda Iron & Steel Co.'s works at North Tonawanda, N. Y., are now in operation, the men having returned to work of their own accord. Furnace A was blown out and is being relined.

The Q. & C. Co., manufacturer of railway specialties, machinery and pneumatic tools, will operate in its own name after June 1. Its principal officers will be in the Western Union Building, Chicago; New York office, 114-118 Liberty St., and the general sales department at its shops, Chicago Heights, Ill.

ANDREW CARNEGIE RESEARCH SCHOLARSHIPS.

The Andrew Carnegie gold medal for 1902 has been awarded by the council of the Iron and Steel Institute to Dr. J. A. Mathews, of New York, for the research carried out by him as a holder of an Andrew Carnegie Research scholarship during the past year. The medal has been designed by G. W. de Saulles of the Royal Mint. The first recipient, Dr. Mathews, had previously received a fellowship for the encouragement of scientific research from Columbia College, New York City, where he has been working under the guidance of Prof. H. M. Howe. For the present year the council of the Iron and Steel Institute has awarded six Andrew Carnegie Research scholarships each of the value of £100. The following are some particulars of the careers of the successful candidates:

Octave Boudouard, of Paris, aged 30, has already published 32 original memoirs and in conjunction with Prof. Le Chatelier, four books. He is assistant professor of chemistry at the College of France and has received in France bronze and silver medals for research.

William Campbell, of New York, aged 25, has published papers for the Institution of Mechanical Engineers, the American Chemical Society, and the Franklin Institute. He studied

FACSIMILE OF THE CARNEGIE GOLD MEDAL FOR 1902, JUST AWARDED BY THE IRON AND STEEL INSTITUTE.

at the Durham College of Science and was awarded an 1851 Royal Exhibition scholarship to the Royal School of Mines, London. He is now working under Prof. H. M. Howe at Columbia College.

Alfred Campion, of Cooper's Hill, aged 27, is a member of the Iron and Steel Institute, who has had practical experience with the Steel Company of Scotland, and has written papers for Glasgow societies.

Percy Longmuir, of Manchester, aged 25, was a student of the Sheffield University College. He has had experience in foundry work and has written several papers on that subject, having contributed to a number of technical papers in the United States.

Ernest Schott, of Berlin, aged 26, studied under Prof. Ledebur, of Freiburg, and is assistant in the Royal Testing Institution at Charlottenburg. He has published a number of original memoirs.

Frederick Henry Wigham, of Wakefield, aged 32, is a member of the Iron and Steel Institute. He is steel works manager for George Cradock & Co. and communicated, in conjunction with Mr. Stead, a paper on steel for wire making to the Iron and Steel Institute last year.

Work on the erection of the Griffiths Charcoal Iron Mills, Washington, Pa., is progressing rapidly and nearly all the machinery has already been installed. It is probable that the entire plant will be in complete operation on July 1.

The Treasury Department has sent to the collector of customs at Philadelphia a decision relating to exports of cast iron pipe made from imported pig iron or scrap of imported pig iron. It decides that such cast iron pipe is entitled to drawback, subject to the usual regulations concerning manufacturing records, etc. The basis on which drawback is to be granted is 105 pounds for each 100 pounds weight of exported pipe.

PERSONAL.

At a recent meeting of the board of directors of Jones & Laughlins, Ltd., Pittsburg, Pa., Willis L. King in addition to his duties as vice-chairman was appointed general sales agent with the following assistants: Roland Gerry, assistant general sales agent in charge of the cold rolled department and Robert Geddis, assistant general sales agent in charge of the hot rolled department.

W. L. Mellon, of Pittsburg, and Henry Aiken, the well known mechanical engineer, have been elected members of the board of directors of the Standard Steel Car Co. which is erecting a steel car plant at Butler, Pa.

T. L. Haughton has become manager of the Sloss-Sheffield Steel & Iron Co.'s furnaces at Birmingham, Ala. He succeeds Gentry Hillman. Mr. Haughton was formerly connected with the Republic Iron & Steel Co., at Thomas, Ala.

M. C. Webster has resigned as superintendent of the Malleable Iron Works, New Britain, Conn., and has been succeeded by J. Fautter.

Samuel McDonald, of Youngstown, O., has accepted the position of superintendent of the Ensley plant of the Tennessee Coal, Iron & Railroad Co., Ensley, Ala. Until recently Mr. McDonald was superintendent of the Bessemer plant of the Republic Iron & Steel Co., at Youngstown, O., and for a number of years was connected with the Ohio plant of the National Steel Co. at the same place.

John F. Budke, of Cannonsburg, Pa., has resigned as president of the Parkersburg Iron & Steel Co., Parkersburg, W. Va. His successor has not yet been elected.

At a recent meeting of the board of directors of the Crucible Steel Co. of America, held at Pittsburg, Frank B. Smith, who has been secretary, was promoted to the office of general manager. H. N. Babcock, formerly assistant to the president, was elected secretary. Mr. Babcock's position has not been filled.

D. G. Kerr, ore agent of the constituent companies of the United States Steel Corporation, has made an extended trip over the corporation's properties. He was accompanied by President Olcott of the Duluth Missabe & Northern Railroad and W. R. Marrian, geologist.

John M. McConnell, superintendent of the Ensley plant of the Tennessee Coal, Iron & Railroad Co., Ensley, Ala., has resigned, the change taking effect June 1.

At the recent meeting of the board of directors of the Tennessee Coal, Iron & Railroad Co., held at New York, officers were elected as follows: D. H. Bacon, chairman and president; Frank S. Witherbee, first vice president; Charles McCreary, second vice president; L. T. Beecher, secretary and treasurer; H. R. Sloat, assistant secretary and treasurer. The presidency of the company has been vacant since last November when N. Baxter, Jr., resigned.

The official report of iron shipments from Alabama and Tennessee in April shows 145,261 tons of pig iron and 17,821 ton of cast iron pipe. Of the pig iron shipped, 78,239 tons went from the Birmingham district, which also furnished 7,833 tons of the cast iron pipe. The steel billet shipments aggregated 8,425 tons. The exports of pig iron were 149 tons and of pipe, 592 tons.

RAND BELT AND MOTOR-DRIVEN COMPRESSORS.

The accompanying illustrations show a new type of air compressor designed for machine shops, foundries, and other industrial establishments where little attention can be given to a compressor and where compactness, simplicity and strength in design are appreciated. The compressor requires a small floor space so that it can be set up "out of the way" and is driven by belt direct from a main shaft or countershaft, or, as shown in the illustrations, it is conveniently driven by a gas engine or electric motor. As a direct connected gear driven compressor for portable or stationary use, the design permits of the most compact arrangement. Two machines may be operated by the one motor, if circumstances require it.

Each compressor has two single acting vertical cylinders, fitted with extra long trunk pistons, which art as guides for the lower ends of the connecting rods. This does away with stuffingboxes and crossheads, and reduces the height of the machine as well as the number of bearings. The cranks are set opposite to each other so that one piston and one connecting rod are moving downward while the opposite piston and connecting rod are moving upward. One side thus perfectly counterbalances the other.

The belt wheel is placed between the two main bearings and is made unusually large, with broad face to give ample belt power without straining the belt. Its rim is made very heavy so that it acts as a balance wheel. In the direct motor-driven compressor the belt wheel is replaced by a heavy gear wheel as shown.

For pressures above 25 pounds the cylinders are water-jacketed and are cast in one piece with the frame, insuring rigidity. They are bored on a special machine and finished with a reamer. The main bearings are also bored out at the same time. The main bearings are fitted with removable shells made of hard babbitt metal, which when worn out can be easily replaced at slight expense, thus restoring the original correct alignment of the machine.

Both crank pins and crosshead pins are made of special steel and are hardened and ground. The connecting rod is of malleable iron, and there is no strain on it except that of compression, as all work is done on the outward stroke. Both ends of the connecting rod are bored out and fitted with hard bronze bushings, which can be easily and cheaply renewed when they are worn out.

The inlet and outlet valves are of the poppet type, fitted with light springs, and work vertically. On account of their position at the bottom of the cylinder they are well lubricated, and also on account of their vertical position there is no tendency to wear down out of line with their seats. They are made from drop forgings, are light and practically indestructible, do not hammer the seats and are prevented from getting into the air cylinder (in case of breakage) by sheet steel guards.

The inlet valves for both cylinders take air from a common passage, which is tapped to receive a pipe leading out doors or to some place where air at a lower temperature may be obtained. The outlet valves on both cylinders discharge into a common passage, which is tapped to receive a pipe connecting with the air receiver.

The base of the machine is high enough so that the air heads can be readily removed. Any valve can be removed without disturbing the air head, by simply unscrewing the cap over the particular valve. The main bearings, crank pins and crosshead pins are of unusually generous proportions and these bearings will run for long periods without readjustment. The pistons are packed with cast iron snap rings of approved construction. Each compressor is fitted with an automatic regulating valve attached to the common inlet pipe, which throws off the load without stopping the machine, when the pressure reaches a predetermined limit, and again throws on the load as soon as the pressure is lowered.

Efficient means are provided for lubricating the cylinders and all bearings. At the top of the cylinders there is a metal projection which catches the drip from the main bearings and crank pins, and any oil which may work out from the cylinders. These compressors are designed for air pressures up to 150 pounds per square inch, and range in capacity from 16 cubic feet to 500 cubic feet of free air per minute.

Estimates are furnished by the Rand Drill Co., 710 Park Building, Pittsburg.

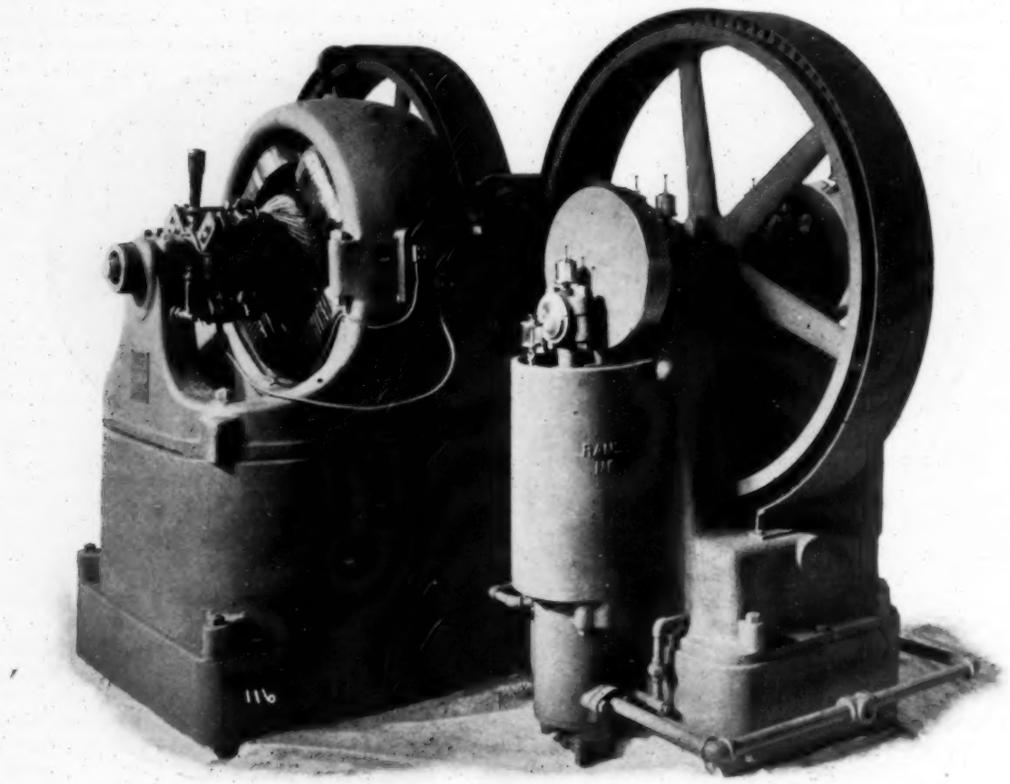


FIG. 1.—DIRECT MOTOR-DRIVEN AIR COMPRESSOR.

RAILROAD TRACK-LAYING BY MACHINERY.

The laying of railroad track is popularly considered as a tedious and laborious task. The constant repetition of the one cycle of operations, and the weight of the units moved, constitute a round of toil with few compensating pleasures. These disadvantages are in addition to the out-door exposure to severe changes in weather and temperature and the inconveniences inseparable from such an isolating occupation. The peculiar nature of the work would seem to debar any other than manual labor for its successful handling, but the mechanical engineer has striven by various means to enter the field with equipment more nearly in touch with the higher efficiency of modern machinery methods. Few of these projects have mastered the difficulties so successfully as to come into general use but an arrangement has been described in *Engineering News* which suggests a workable solution and is a very interesting application of machinery to railroad construction.

The machine—and the term requires additional breadth when applied in this instance, as compared with its usual significance—has been designed by R. E. Hurley, of Scranton,

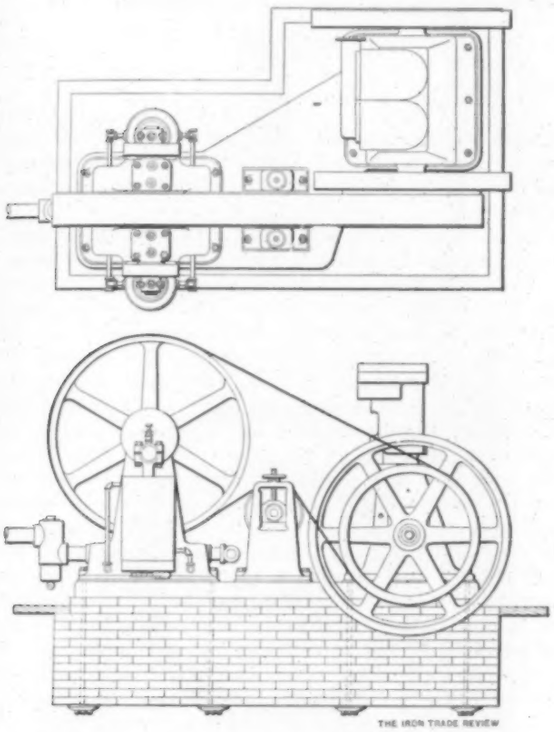


FIG. 2.—PLAN AND ELEVATION OF AIR COMPRESSOR DRIVEN BY GAS ENGINE.

Pa., and has been used in the laying of track on the Bessemer & Lake Erie Railroad, near Greenville, Pa. The construction train is preceded by a machine car with a truss-derrick extending 60 feet over the road bed. This is followed by another car with an elevated platform with boiler, fuel and water supplies, and in the rear of these comes the construction train proper with sixteen cars of ties, rails, etc. At the center of each of the rail and tie cars, and about a foot from each side, is placed a roller and on these rollers two lines of rails are carried forward to the head of the train. The power is furnished by a cluster of friction rolls in the machine car. When the rail arrives at the machine car it is disengaged from those in the rear, by taking out a bolt, leaving the angle bar on the rear end of each rail as it is sent out into the derrick to a point about 20 feet in advance of the machine car wheels. As the train moves slowly forward at a rate of 20 or 30 feet per minute, the suspended rail reaches a point about one foot back of the previously laid rail, and is moved ahead by hand, the bolting being done while the train is slowly moving forward.

The ties are loaded on cars between the machine car and the cars of rails, and the moving rails act as a tie conveyor and are delivered to the derrick car and thence taken by an endless chain and deposited some 12 feet in advance of the outward end of the rail. Special appliances in the shape of tools are also used with the machine, making it possible to work with a rapidity that would at first seem out of the question.

Altogether it is a remarkable machine which with the rated capacity of two miles of track per day with 40 men, and the decided willingness of most of the railroad corporations to adopt improved equipment, will naturally tend toward the early increase of railroad facilities.

Fierro Mines of the Colorado Fuel & Iron Co.

Fierro, New Mexico, and the iron mines there operated by the Colorado Fuel & Iron Co., are described in the current number of *Camp and Plant*, the weekly publication of the sociological department of the company. The other two sources of ore supply of this company are at Orient, Col., and Sunrise, Wyoming. Of the Fierro mines the article says:

"Very little work was done, except the taking of copper ore from the Hanover mine, until 1899 at which time the Colorado Fuel & Iron Co. took hold of the iron deposits. The 86 mine was the first opened in the spring of '99. The Jim Fair was opened later on, during that year. Work on the Union Hill was begun in the spring of 1901. The Union Hill mine is situated on the right hand wall of the oval basin, or valley, midway between Hanover and Fierro. The ore is a mixture of 75 percent of magnetite and 25 percent of hematite, very hard, and requiring especially hardened drills and heavy charges of powder to dislodge it. It is then loaded into steel truck cars holding two to four tons, and lowered to the railroad 500 feet below, down a self-acting incline by means of a one and one-half inch steel cable 2,000 feet in length. At the bottom of the incline a tipple is arranged so that the ore is dumped into a Gates crusher, and is there broken into pieces, apple size, then falls to the railroad car below. A Victor box car loader is also on the ground, ready for use.

"About 125 men, mostly Mexicans, are employed at this mine. The work is hard, rough and dangerous, but owing to the unique system of derailing switches and warning signals accidents are very rare. Seven hundred tons of this ore, making 30 cars, is shipped to Pueblo each day to be fed into the blast furnaces at the Minnequa Works. Some fifteen men are employed at the Jim Fair mine. The ore is just the reverse in percentage composition of that of the Union Hill, being 75 percent hematite and 25 percent magnetite. This ore is also very hard, requiring the same drilling and blasting to dislodge it. The average percentage of metallic iron in both mines is about 60. Very little tunneling is done here, as at Orient and to some extent at Sunrise, because at Fierro the ore stands in immense dykes and is quarried out in open cuts. The 86 mine is not being worked at present. Water is obtained, if obtained at all, from the underflow a few feet below the surface in the bed of the dry creeks. The question of water is the greatest problem contended with and in certain seasons of the year the supply has to be shipped in."

At a stockholders' meeting of the Lackawanna Steel Co., Buffalo, N. Y., the following directors were elected: D. C. Blair, W. E. Dodge, Warren Delano, Jr., B. H. Buckingham, Cornelius Vanderbilt, Walter Scranton, D. O. Mills, M. T. Payne, Moses Taylor, J. G. McCullough, H. A. C. Taylor, A. Iselin, Jr., H. McK. Twombley, Henry Wehrum, J. J. Albright, Edmund Hays, H. Walters, Samuel Mathers, J. Malcolm Forbes and B. S. Guinness. Officers have been elected as follows: Walter Scranton, president; Moses Taylor, vice president; J. P. Higginson, treasurer; J. Q. Farquhar, secretary, and Henry Wehrum, general manager.

The *World's Work* for June has three articles of industrial import, all given extended treatment. G. W. Ogden answers the question, "Why the Price of Beef is High"; Arthur Goodrich, in an article accompanied by 30 pictures of ocean vessels and shipping scenes, forecasts the future of American shipping; and Harrison Lewis, recently returned from Cuba, pictures the real financial and industrial status in the new republic. Numerous other features maintain the standard this excellent magazine has set.

USEFUL PNEUMATIC TOOLS.

Compressed air tools have accomplished much in the way of expediting work in many lines of industry. This is especially noticeable in the application of pneumatic tools for repair work such as must be encountered in railroad shops. The character of the work in the boiler and smith shops naturally affording a greater field to test the utility of such tools, it is here that they are found to be the most useful.

The accompanying illustrations show a pneumatic-hydrostatic pressure accumulator and a pneumatic hammer invented by Alfred Parfitt, foreman boilermaker in the Topeka shops of the Atchison, Topeka & Santa Fe. The hydrostatic machine is patented, the latter is not. The pneumatic hammer is a particularly convenient all-round tool. The device may be made any size to suit the work in hand. It can be cheaply constructed and a laborer can with a little practice become expert in handling the operating valves. The main cylinder in this case is made of 3-inch wrought iron pipe, 5 feet long. A plug is welded in the one end, as shown. Originally this plug was screwed in, but the knock of the hammer, due to the return stroke, soon resulted in injury to the thread, although the impact was on the rubber cushion. The plug in the opposite end or tool holder is screwed on, as the full force of the blow is transmitted directly to the work through the medium of the tool resting in the socket at its outer end. The hammer, which is 20 inches long and weighs about 40 pounds, is operated by two plug valves, H and K, with the arrangement of piping, as shown. These valves are drilled to operate as a three-way cock, and by turning the handle K so that the port stands lengthwise to the pipe, air is admitted through the contracted port opening M, and the hammer is driven to the opposite end of the cylinder. The valve is then returned to the position shown in the cut and the valve H opened. The opening, N, being large, offers little resistance to the flow of air, and the hammer is driven to the other end of the cylinder with great force. The cylinder is supported by block and tackle and preferably held to the work with a slightly downward inclination of its forward end. This tool has been found particularly useful in breaking staybolts in firebox legs that are inaccessible with the ordinary staybolt breaker. It is also used for cutting off rivet heads in firebox sheets and one blow is sufficient to cut off crown bar nuts and heads. A shorter arrangement of this same tool is used for heading crown bar bolts, by means of a concave tool placed in the socket. In fact, the tool may be put to many uses in and around the boiler shop and three men will perform as much work as six men with ordinary appliances, where the character of the work demands heavy sledging.

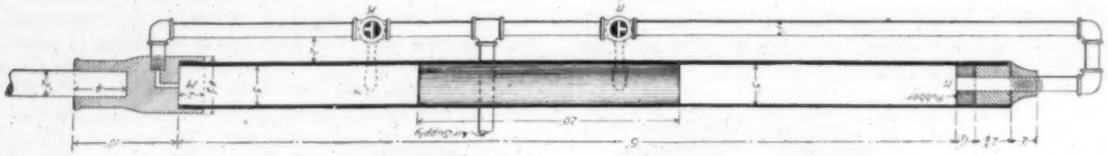


FIG. 1.—PNEUMATIC SLEDGE HAMMER.

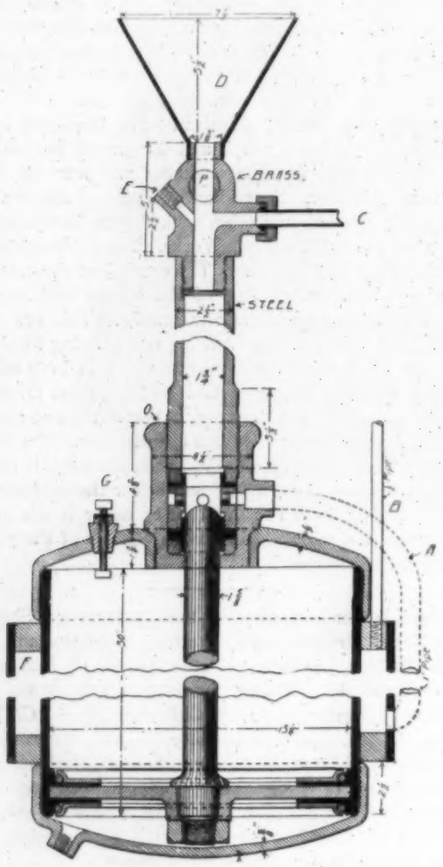


FIG. 2.—PNEUMATIC HYDROSTATIC ACCUMULATOR.

The pneumatic-hydrostatic pressure accumulator here shown was made primarily to be used for punching sheets in repairs to fireboxes and boilers where operation is necessary without removing the sheets. The device is mounted on a truck and may be moved near the work in hand. The main cylinder is 13¼ inches in diameter and is made of cast steel having flanged heads on either end. Around the outside of the cylinder is a water space F. A stuffing box O is screwed into the top head, which is flanged inwardly to provide for the thread. A steel cylinder is again screwed into this, which is surmounted by a brass cap containing an ordinary plug valve P. C is a ⅜-inch copper pipe which leads to the punch, which is not shown, being the ordinary form of small jaw punch having a 4-inch plunger and capable of being easily handled by the workman. To place the machine in condition for operating the valve P is opened and the upper cylinder or steel pipe is filled with water through the funnel D, the pipe A furnishing means to fill the space F surrounding the main cylinder. The valve P is then closed. A slight auxiliary pressure is necessary to bring the punch to the plate each time before punching, and this is accomplished by turning the air pressure into the ½-inch pipe B by means of a small plug valve connected with the main pressure pipe. This places a pressure on the water in the receiver F and brings the punch to place on the work. Air is then turned in at the bottom of the large piston which forces the 1⅝-inch ram above the openings leading to pipe A, as shown, thereby relieving the auxiliary cylinder of excessive pressure. The ram is then forced through the pipe C, the pressure, of course, depending upon the amount of air pressure used. The valve G is used as an indicator in order that the operator may know that he is receiving the full pressure at all times, and that the piston is not in contact with the head. A pressure gauge may be connected at E, which would also serve the same purpose. With 100 pounds pressure on the large piston, using a 4-inch diameter plunger in the punch, a pressure of about 40 tons is available.

This machine will readily punch 1-inch holes in ½-inch and 9-16-inch steel plate, and is very convenient from the fact that it may be used in any portion of the shops and is not a very expensive tool to construct in view of the results obtainable by its use.—[Railway Age.

A press dispatch says that the blast furnace workers at Sharon, South Sharon and Sharpsville, Pa., held meetings this week and decided to go out on strike June 1 if their demand for an eight-hour day was not granted.

AN AUTOMATIC BLUE PRINTING APPARATUS.

This portable machine has been designed by a practical engineer and contractor and is made under his supervision by the Elliott Electric Blue Print Co., of Pittsburg. The apparatus consists of a transparent cylinder mounted in a metal frame with means whereby the gas cylinder may be locked in either a vertical or horizontal position. The engravings, Figs. 1 and 2, illustrate the two positions, and it will be seen that an arc lamp is suspended above the cylinder with suitable mechanism for raising and lowering the lamp into and out of the glass case. The electric lamp is supported by means of a standard with a horizontal arm, this standard being fastened to the extension of the portable frame.

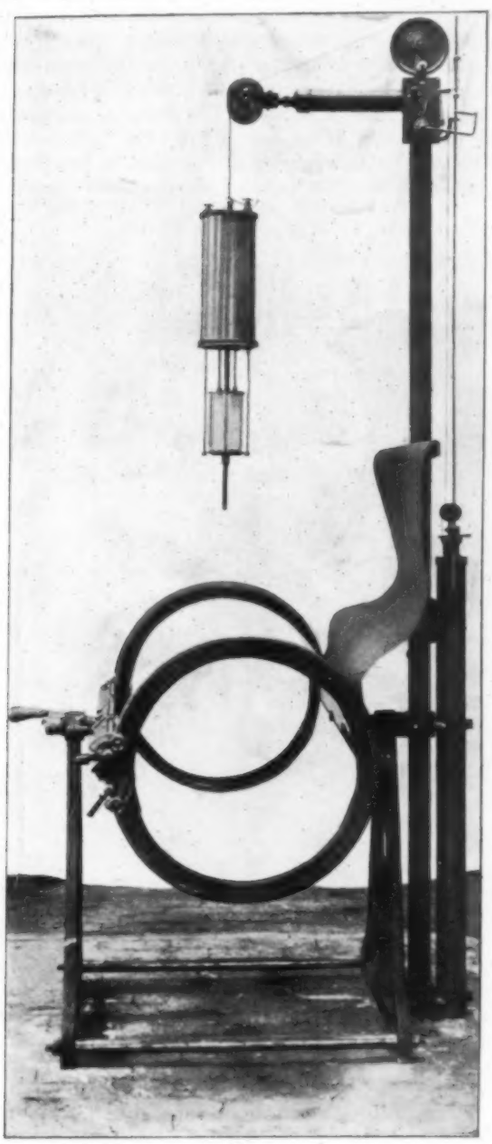


FIG. 1.—AUTOMATIC ELECTRIC BLUE PRINTING MACHINE.

The cylinder is arranged to make two prints at the same time. The frame is first rotated to a horizontal position and locked, then the tracing and the sensitized paper are inserted and the whole covered by a canvas mat which may be drawn taut by one or the other of the small crank handles thus providing perfect contact between tracing and sensitized paper. The cylinder is then turned half way around and the other side loaded in the same manner. Subsequently the frame is returned to a vertical position and locked. The current is then switched in by means of a ready connection, and after the starting of the lamp on the downward movement by the release of a ratchet and pawl the rest of the action is entirely automatic, the current being shut off when the lamp has reached the lowest point in its descent. The downward speed of the lamp can be regulated by the operator, the range being between 5 seconds and 20 minutes, depending upon the degree of sensitiveness of the blue print paper employed.

The raising and lowering mechanism consists of a vertical cylinder rigidly attached to the upright lamp support and containing a hollow piston rod. The lamp acting as a counterbalance to the piston is gradually lowered by being attached to the piston rod, which is provided with a valve for the purpose of regulating the downward speed of the lamp, thereby getting perfect regulation for any print that the user may determine to make. The speed adjustment depends upon a fluid for retarding the motion of the piston and a valve controls the flow of the liquid.

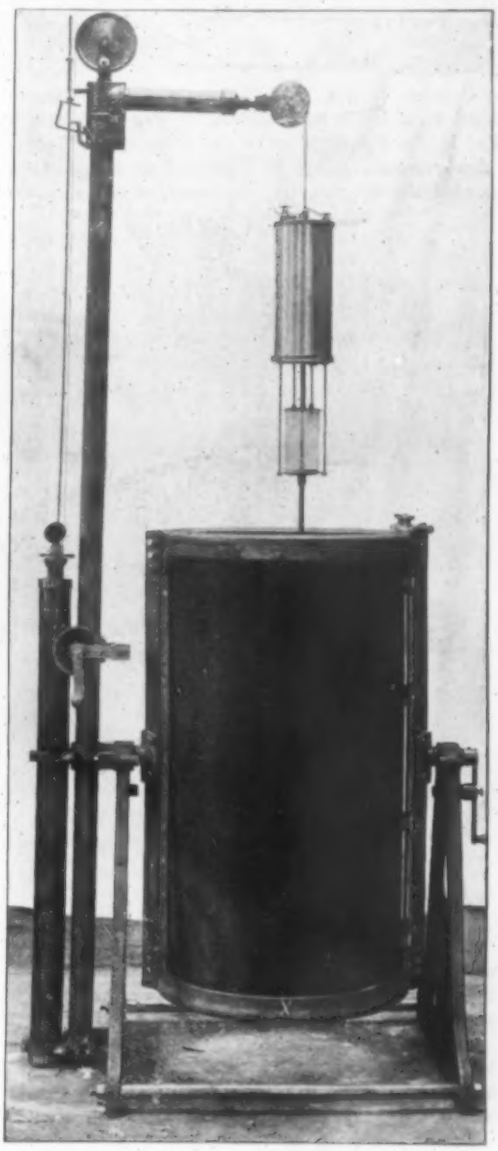


FIG. 2 —AUTOMATIC ELECTRIC BLUE PRINTING MACHINE IN OPERATION.

On top of the piston rod is a shaft carrying two small drums, one being connected to the reel operated by the crank handle shown in Fig. 2. The other drum has a connection over the sheave at the top of the standard with another drum at the outer end of the horizontal arm above the lamp. On the same shaft on either side of this drum are two others, around which are coiled the lamp feed wires which also support the lamp. Current is supplied to these wires by two small brushes on either end of the shaft. The lamp circuit is closed by a switch on top of the piston rod and is opened automatically when the piston in its upward travel comes in contact with the trigger near the top of the standard.

The arc lamp used is a 15-ampere, for either alternating or

direct current, and is made adjustable for several voltages. Special attention should be called to the fact that the size given for each machine is simply the printing surface of one-half of the cylinder as the machine makes two prints at each exposure of the size listed. The apparatus is made in five standard sizes from 30x42 up to 42x84 inches but larger or special sizes are made to order.

The Archer Iron Works, 34th Place and Western Ave., Chicago, manufacturers of steel wheelbarrows, have increased their capital stock from $5,000 to $15,000. The officers of the company remain as before: W. F. Klemp, president; James O'Donnell, treasurer; Irene A. Welch, secretary. The business of the company has been such during the past few months that it has doubled its capacity and the present condition of its contract and order books shows that a very busy season is ahead.

The Republic Iron & Steel Co. has awarded contracts for additional mills and a large amount of new machinery to be installed in the Sylvan plant of the company at Moline, Ill. The Youngstown Foundry & Machine Co., Youngstown, O., was awarded the contract for the conveyor tables, and the Morgan Construction Co., of Worcester, Mass., a contract for the construction of two continuous heating furnaces by which billets 30 feet in length can be handled. Jones & Laughlins, Ltd., of Pittsburg, was awarded the contract for the pulleys, hangers and shafting. Work on the improvements will be commenced immediately and it is probable that the plant can be placed in operation in December or January.

The Alberger Condenser Co., of 95 Liberty St., New York, has recently received an order for important condensing equipment to be installed in the steam turbine testing room of the new shops of the Westinghouse Machine Co., at East Pittsburg, Pa. This consists of an 8,000-square foot surface condenser of the Alberger high vacuum type, a Corliss two-stage dry vacuum pump and a centrifugal circulating pump connected to a Westinghouse engine. Owing to the high vacuum desired in steam turbine practice, this condensing outfit is to maintain 28 inches of vacuum.

The John A. Roebling's Sons Co., Trenton, N. J., has announced a voluntary raise in the wages of its employes, numbering about 4,000, averaging nearly 10 percent. An officer of the company said that the increase was made on account of the higher prices of all articles.

CINDER CAR FOR BLAST FURNACE USE.

The construction of a cinder car manufactured by M. H. Treadwell & Co., of 95 Liberty St., New York, with works at Lebanon, Pa., is shown in some detail in the accompanying illustrations. It has been designated by the manufacturers the Tread-Kill cinder car, and its construction is with special reference to the ready turning of the ladle on its axis by the use of intermeshing gears. In dumping the ladle pours the hot blast furnace cinder out on either side of the railroad track and as far away from it as possible. This is accomplished by the lateral movement the ladle has on the car trucks supporting it.

The general construction of the car with connecting underframe is such as to eliminate the heavy strains upon the bale which are often met with in ladle cars. The operating mechanism consists of cut wrought iron worms running in cut cast steel wheels. The driving gear, worm and worm wheels are all machine cut. When the ladle is full of hot cinder and is at the place where it is ready to be dumped, one man can operate the racking device, which turns the ladle half way round on either side, emptying the contents in two minutes.

The standard M. C. B. types of axles, wheels, brasses, car boxes, trucks, automatic couplers and cast steel truck bolsters are used, allowing the substitution of any standard articles in these classes. All parts are made interchangeable, permitting quick replacements in case of accident. The ladle and lining are of standard size, and the height and length of car and the gauge of track are also standardized to those now in use. The gearing frames, connecting underframes, truck bolsters, end frames—all the car, in fact, except the lining, car boxes, car wheels and bale—are of cast steel. The weight of the car is 60,000 pounds, and its capacity is 16 tons of cinder or 200 cubic feet.

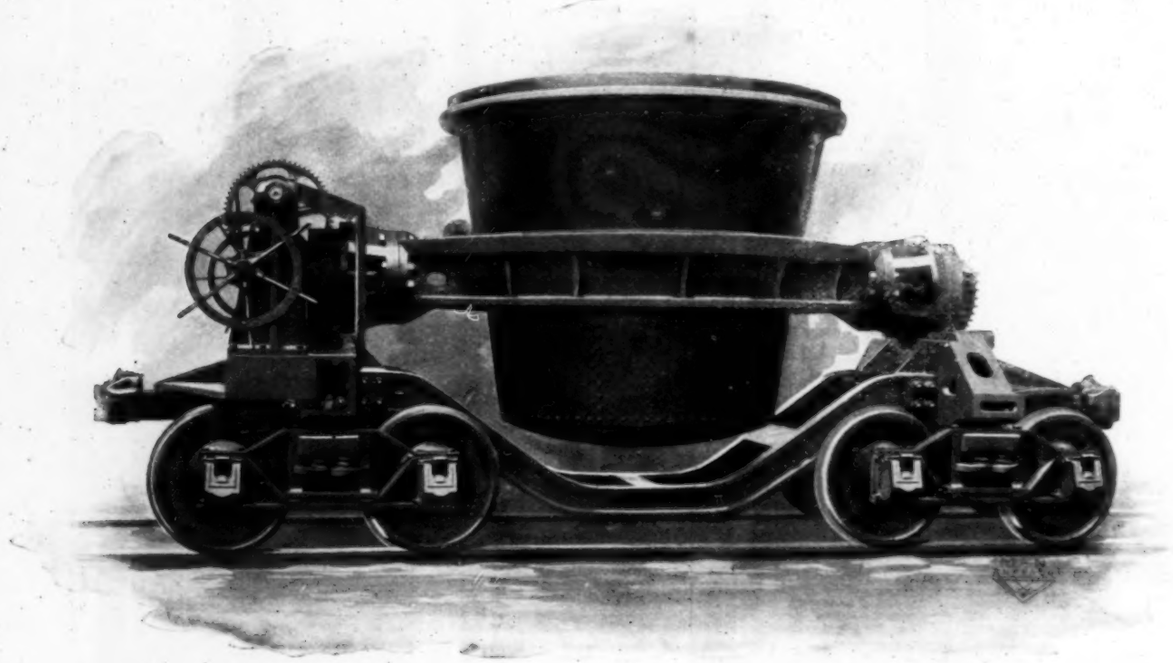


FIG. 1.—THE TREAD-KILL CINDER CAR FOR BLAST FURNACES.

The Rogers Iron Co., of Springfield, O., for many years prominent in the building iron business, is specializing more and more in manufacture of fence and railing. The company is now running the largest force of men it ever employed, and is with difficulty keeping up with orders. Extensive improvements have been made in plant and in handling of such work, and others of importance are in contemplation.

The Anderson Forging Co., Anderson, Ind., manufacturer of buggy hardware, closed down temporarily last week awaiting the arrival of steel.

PRODUCTION OF NICKEL AND FLUORSPAR IN 1901.

"Mineral Resources of the United States, 1901," United States Geological Survey, now in press, will contain the report of Dr. Joseph Hyde Pratt on nickel, cobalt, fluorspar and cryolite for 1901. It says of nickel and fluorspar:

The two principal sources of nickel are the nickeliferous pyrrhotite, the most widely spread of the nickel ores, and genthite, especially the garnierite variety. In this country the domestic product of nickel has been as a by-product from the lead ore of Mine Lamotte in Missouri, since the shutting down of the Gap nickel mine, in Lancaster County, Pa., about 50 miles west of Philadelphia, about ten years ago. This mine was worked from about 1863 to 1880, when work was discontinued because of the abundant supply of nickel matte from Canada. Traces and small amounts of the nickel minerals genthite and garnierite have been found in North Carolina, but not in commercially sufficient quantities, though a deposit of nickel ore averaging 1.5 per cent nickel is reported near Morgantown, Burke County. Similar occurrences of nickel silicate are found in Oregon, where the percentage of nickel ore is much greater than in the North Carolina minerals. The Oregon deposits are on Piney Mountain, in Douglas County, about three miles a little north of west from Riddles, a station on the Southern Pacific Railroad, and a high grade cobalt ore deposit is being developed in the eastern part of the State.

Nickel ore is reported to occur in some quantity at the Congress Mine, in Upper Nine-Mile section, about 14 miles north of Keller, Ferry County, Washington. This section was formerly worked for copper and gold, but was abandoned. In the latter part of 1901 the claims were again taken up and are now being developed for nickel.

The Wyoming nickel ores, near Sheridan, Sheridan County, do not seem to contain nickel in commercial quantity; at Piney Creek, also, nickel ore is reported. Near the northern border of Churchill County, in Cottonwood Canyon, about 45 miles from Lovelock, Humboldt County, Nevada, deposits of niccolite and gersdorffite have been prospected as nickel ores; and deposits have also been reported at Bunkerville, Lincoln County, and near Candelaria, Esmeralda County. They have not yet been producers of nickel ores. It is reported that the Magnetic Mine, near Tucson, Arizona, contains nickel ores in quantity and that they are now being investigated by Eastern capitalists. Nickel ores are reported also as found on Spring Creek, in the Black Hills, South Dakota, about 11 miles northwest of Custer, and at the St. Joe Mine, Blackbird, Lemhi County, Idaho.

A recent discovery of nickeliferous pyrrhotite is reported near the head of Skowl Arm, near Ketchikan, in Southeastern Alaska, where the ore is stated to be in two parallel veins. Nearly all the nickel used in the United States is obtained from the mines in the Sudbury district, Canada, which produces probably one-half of the nickel used in the world. The other chief sources of nickel are the mines of New Caledonia, in the Pacific Ocean, and of Silesia, Austria. Nickel deposits are being developed satisfactorily near Hangesund, in Norway; and a supposed extensive deposit of nickel has been discovered on the headwaters of Tulameen River, British Columbia.

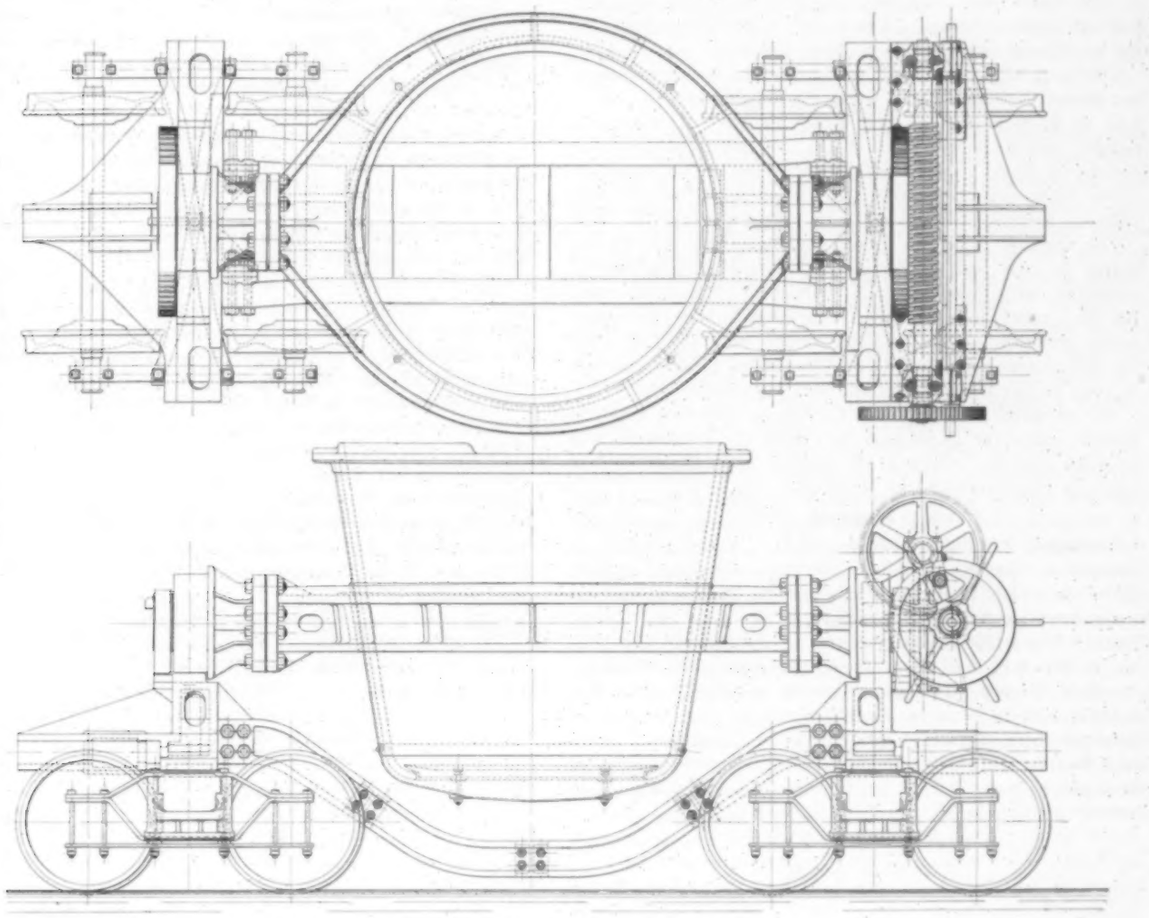


FIG. 2.—PLAN AND ELEVATION OF THE TREAD-KILL CINDER CAR.

The first use of nickel was in making German silver. It is also used extensively for coinage by the United States and many European countries; also when welded upon iron and rolled into sheets, for making culinary utensils and other objects. Its most important use is in making nickel steel, now used in large quantities in the production of armor plates, turrets, propeller shafts, bicycles, etc.

Nickeloid, a nickel plated sheet of zinc which is noncorrosive and does not oxidize or rust, is largely used in making bathtubs, refrigerator linings, etc.

A new nickel alloy of nickel, aluminum, and copper, which can be rolled into plates and bars, has recently been introduced by a Berlin manufacturer.

The only nickel and cobalt produced in the United States

during 1901, were as by-products at Mine Lamotte, Missouri; and the matte containing the nickel and cobalt was refined at Constable Hook and Camden, New Jersey. There were obtained 6,700 pounds of nickel, valued at $3,551, and 13,360 pounds of cobalt oxide, as compared with 9,715 pounds of nickel, valued at $3,886, and 6,471 pounds of cobalt oxide produced in 1900. This is a decrease of 3,015 pounds in the production of nickel, and an increase of 6,889 pounds in the production of cobalt oxide. Elaborate experiments have been made by the Canadian Copper Co. to refine, in Canada, the nickel copper matte from the Sudbury mines, but thus far in vain, the greater part of this matte being refined in the United States.

The amount of nickel imported and entered for consumption in the United States in 1901 was 117,364,337 pounds, valued at $1,847,166, as compared with 57,955,988 pounds of nickel matte, etc., valued at $1,323,630 in 1900. The amount of nickel produced from matte and ore imported into the United States was 10,497,097 pounds, worth between five and six million dollars. There was a decided increase in the production of nickel from New Caledonia ores in 1901.

The price of nickel oxide has been about five cents lower per pound than the metal, while the cobalt oxide has been sold at $2.20 a pound. The nickel industry is increasing rapidly, and there has been, also, a decided increase in the amount of nickel used in the United States. The export of nickel oxide and matte from the United States in 1901 was 5,869,655 pounds, as compared with 5,869,906 pounds in 1900.

The amount of cobalt oxide imported into the United States in 1901 was 71,969 pounds, valued at $134,208, as compared with 54,073 pounds, valued at $88,651 in 1900. As the United States refines the greater part of the nickel matte produced at the Sudbury mines, naturally the United States exported nickel to the amount of 5,869,655 pounds in 1901, or 251 pounds less than was reported in 1900.

The production of nickel in Canada in 1900 was 8,729,000 pounds, valued at $4,364,500; in France the production was 3,746,800 pounds, valued at $1,020,000; in Germany it was 4,383,756 pounds, valued at $1,999,940.

Fluorspar.

Fluorspar, or fluorite, is generally found in veins in limestones, sandstones, mica slate, clay slate, and gneiss. Although widely distributed, this mineral has been found in commercial quantities in but few localities in the United States. Until 1898 the only source of fluorspar in the United States was the mines in Hardin and Polk Counties, Southern Illinois. The same general geological formation extends over to Western Kentucky, and in 1898 deposits of fluorspar were discovered around Salem, Livingston County, and Marion, Crittenden County, Ky. A small amount of fluorspar is also obtained from Caldwell County, Ky. In a number of cases by-products are obtained, as galena, which is saved by the Rosiclaire Lead & Fluorspar Co., the largest operators of the mines in Illinois, and as zinc carbonate, obtained by the Chicago Mining Co. from their mines in the vicinity of Marion, Crittenden County, Ky. The Kentucky Fluorspar Co., the Fluorspar Co., and the Western Fluorspar Co. have opened mines in Crittenden County, Ky., and are now producers of this mineral. The Eagle Fluorspar Co. is producing from deposits in both Crittenden and Livingston Counties, Ky. Fluorspar deposits have recently been discovered in Smith, Wilson, and Trousdale Counties, Tenn.; and the Tennessee Fluorspar & Mining Co. has been incorporated to work deposits near Bellwood, Smith County. In the vicinity of Dome, Yuma County, Ariz., fluorspar occurs abundantly. If the demand for the use of fluorspar for smelting purposes increases, there will be a market for these Arizona deposits. Formerly the chief use of fluorspar was in the preparation of hydrofluoric acid, but only a small amount is now used for this purpose.

The use of fluorspar in the manufacture of opalescent glass is increasing. By far the greatest use of fluorspar is as a flux for iron, in which use many advantages are claimed for it and it is rapidly superseding limestone. Fluorspar can be used to advantage, probably, in copper smelting and in reducing many other metals. The total production of fluorspar in 1901 was 19,586 short tons, valued at $113,803, as compared with 18,450 tons, valued at $94,500 in 1900. The average price per ton reported for the product of 1901 was $5, the same as in 1900. The amount of the ground fluorspar sold in 1901 was 3,700 tons, valued at $34,100, as compared with 3,000 tons, valued at $17,000 in 1900—an increase of 700 tons in amount, but of $17,100 in value, the increase being due to the low price of ground fluorspar in 1900, which was only $5.66 per ton; whereas, in 1901, the average price reported for ground fluorspar was $9.03.

The imports of fluorspar are not given separately, as the mineral is included in the Treasury Department statistics among ores and minerals "not elsewhere specified."

TRADE PUBLICATIONS.

Another of their biographical booklet series has been sent out by Wyman & Gordon, manufacturers of drop forgings, Worcester, Mass. It is entitled "A Short Story of George Stephenson," and the cover is adorned with a finely finished portrait in photogravure of the eminent English engineer. The subject is interestingly treated and the publication is a dignified way of reminding the trade that the firm is original and progressive in advertising matters as well as in other departments of its business.

A pamphlet and blotter comes from the Williams Gauge Co., of Pittsburg. The firm manufacture economic steam boiler appliances, including feed water regulators, water columns, etc., of different forms. These are fully described and illustrated and the printed matter embraces a list of firms adopting this line of equipment.

The New Process Raw Hide Gear Co., of Syracuse, N. Y., has a new catalogue and price list of gears, washers, hammers, etc., made of this material. The advantage, construction and cost of the product is submitted at length and the pamphlet is sent out in a wallet which may be used for carrying papers, letters, etc., after the book has served its purpose.

A paper read before the 220th meeting of the New York Electrical Society, Jan. 15, by F. A. C. Perrine, D. Sc., on the "Power Plants of the Pacific Coast," is being sent out in pamphlet form. It contains an exceedingly interesting narrative of the pioneer work of electricians in the far West. In the magnitude of the undertakings, the distances and difficulties of travel, etc., incident to such installations, the electrical development of that region is one of the most impressive examples of modern engineering achievement.

The illustrated catalogue and price list, No. 1, of the Laurel stoves and ranges, manufactured by the Art Stove Co., of Detroit, Mich., covers some 77 pages of elaborate half-tones and descriptive matter.

The C. O. Bartlett & Snow Co., of Cleveland, manufacturer of conveying and elevating machinery, fertilizer, cement and paint mills, etc., sends us a copy of its chain and sprocket wheel catalogue, No. 4. It is a book of 140 6x9-inch pages and is profusely illustrated. Several conveying systems for handling coal, coke, etc., are described.

McCrosky & Huber, of Cincinnati, have a circular containing a new price list of their reamers. These are adjustable and any ordinary variation for wear, etc., can be obtained in a few seconds by means of the wrench furnished with each reamer. The firm also manufactures a combination tool holder which will handle a wide range of tools.

An illustrated catalogue of pipe-threading machinery has been published by D. Saunders' Sons, of Yonkers, N. Y. The work is 6¾x10¼ inches and extends to 125 pages, treating of many forms of hand, belt and electrically driven machinery. The catalogue also treats of the dies, taps and stocks, pipe cutters, wrenches, tongs, etc., manufactured by the firm for steam and gas fitters' purposes.

Several pamphlets and circulars are being sent out by R. D. Wood & Co., of Philadelphia. The firm manufactures cast iron pipe and special castings, gas and water works fittings and valves, etc. The present publications treat of the patent fire hydrants, single and double valve; gate valves, and a numerous class of special pipe connections, etc. These are illustrated at length with tables of weights, capacities and pressures.

The Acme Machinery Co., of Cleveland, is building an office and works addition, to cost $10,000.

FORGINGS FOR ENGINES.*

BY H. F. J. PORTER.

At the Centennial Exposition at Philadelphia in 1876, the large engine built by George H. Corliss had a capacity of 1,400 horsepower and it was the largest of its day. Similarly a representative of its time at the World's Fair at Chicago, in 1893, made by the Edward P. Allis Co., of Milwaukee, was capable of developing twice that power. Now we have many engines in our large cities operating street railways and lighting streets and buildings whose normal capacity is 8,000 horsepower and which can be run continuously with a load 25 percent greater. Our trans-Atlantic liners are equipped with engines running up to 16,000 horsepower and if the necessity should arise there is no doubt but that engines of still larger size could be supplied at short notice.

At the time that George H. Corliss built his Centennial engine he had his own smith shop in which his shafts and other engine forgings were built up out of small faggots of wrought iron. This was about the time when steel began to encroach upon iron in the trades. Before this time, wrought iron was a staple article in the market. The quality of this material, coming from the rolling mills, was very high, demands for high grades having brought about methods of production which supplied the trades with double and extra refined iron, very free from slag and dirt. The small forges sparsely scattered about the country were equipped with hammers of 10 tons falling weight with top steam, sufficient in capacity to thoroughly work and weld together the few small faggots of iron which were required to build up the moderate sized forgings which the various industries demanded. When steel made its appearance, however, manufacturers generally began to appreciate the fact that the market contained a new material, stronger and more reliable than wrought iron. Desirous of making the forged parts of their mechanisms smaller and lighter, they made an attempt at once to obtain forgings made of this metal. Had the forges made proper efforts to acquaint themselves with the nature of this new material before attempting to supply it, a very different condition of affairs would have come about not only in the forging industry, but in the steel industry at large, than that which resulted from the unintelligent effort at production, which was made.

Opposition to Steel Ships.

At a meeting of the Railway Master Mechanics and Master Car Builders at Old Point Comfort in 1899, Capt. (now Admiral) Robley D. Evans made an address in which he said: "In 1882 I had the good fortune to be ordered as a member of what is known as the first advisory board for rebuilding the navy. It was an awfully hot summer, and fifteen of us rather impatient spirits got together in Washington, presided over by Admiral John Rodgers. When we looked the field over, we found that we had no navy at all; we were hopelessly behind the age, and it seemed hardly worth while to rebuild our navy. I shall never forget as long as I live the trouble I caused in that small convention by proposing that we should build steel ships. I was the original steel man, and when I proposed that all ships in the future should be built of steel, Admiral Rodgers adjourned the board for three weeks to prevent a fight."

Now the animus referred to by Admiral Evans was induced by the fact that forgings which were being supplied at this time were of just such a type as might be expected to be produced by men who had not acquainted themselves with the requirements of the new material. While some were excellent in every way others were deficient in strength, or contained concealed cavities and were unreliable in general. The supply of material running so irregular in quality reflected unfavorably upon the steel industry at large and developed an undefined prejudice against steel generally from which it has scarcely recovered in the minds of many users of forgings, even at the present day. It was fortunate for the country that the advisory board referred to contained as stalwart a champion of steel as Admiral Evans, for after they had visited the various ordnance works abroad and had seen steel worked properly they returned home and recommended to the secretary of the navy, Mr. Tracy, that by all means the new navy should be built of this metal and as there were no properly equipped steel forges in this country one would have to be built to furnish the necessary armor, guns and engine forgings required in the construction of modern naval war vessels. Meanwhile this board had overcome, through the good offices of its secretary, the personal objections heretofore existing on the part of Sir Joseph Whitworth to the use of his special steel casting and forging presses, elsewhere than in his own works, which were considered foremost in the manufacture of ordnance. Without entering into the details which accompanied the immediate establishment in this country of the great ordnance works of the Bethlehem Steel Co., it is sufficient to say that in their equipment not only were the special appliances in use in this English works duplicated but their size was doubled. A contract was also entered into at the same time by which the great works of Schneider & Co., of Le Crouset, France, which stood first among the makers of armor plate, were also duplicated at the Bethlehem plant. Thus, there arose in this country a forging plant at once larger and superior to any in the world. * * *

The Steel Forging Industry.

The forging industry has grown from the blacksmith shop, a once familiar adjunct to an engine works, and has become a specialty, and a modern steel forge is not now thought complete unless it melts its own raw material and converts it into the finished product under the supervision of chemists, metallurgists, physicists and microscopists. In order that we may fully appreciate what a delicate material steel is now known to be and therefore how intelligently it must be handled in all its stages of production from the raw material to the finished product, let us run through the processes now considered necessary to manufacture the grade of forgings which, if an engine builder desires to keep in the front of his profession, must have supplied to his engines.

Having carefully considered the service to which a proposed forging is to be put, the charge of raw material for the furnace is made up so that the finished product will have the proper chemical composition, which, from previous experience is found to be most satisfactory. The elements, carbon, manganese, silicon, phosphorus, and sulphur, all have an influence not only on the working of the metal in the shops, but upon the strength of the forging in subsequent service. The product of the open-hearth furnace is found to give most eminent satisfaction, and has been generally adopted for making forgings. In order that the metal of a forging should be thoroughly worked to give it strength and toughness, an ingot should be cast approximately 50 percent larger in diameter than the finished size. Besides this increase there should be from 10 to 25 percent added to its length, for reasons which will become apparent. [Here follows reference to blow holes, piping and segregation].

Forging Operations.

The extra length, having served its purpose of supplying metal to fill "blow holes" and "pipes" and of collecting "segregation," is cut off and returned to scrap. The ingot is then ready for the forging process. The first operation in the process of forging is the reheating of the ingot. This operation is a very delicate one, as great care must be taken to make the heat penetrate the metal slowly and uniformly.

As already explained, the metal in the ingot during the process of cooling is being drawn out in all directions to fill the mold. When it is cold, therefore, it is in a condition of strain throughout its interior. If a cold ingot is put into a hot furnace to be reheated, the surface metal would immediately expand and pull still further away from the center, and thus an additional strain would be put on the inside metal. In very large ingots cracks are thus apt to be started in the center and forgings are very liable to break in subsequent service, from the fact that they have not been properly reheated. A great many forgings fail from lack of care being taken at this time.

Next comes the forging process proper, and one of the first requisites is the proper selection of forging tools. The pressure applied in shaping a piece of steel should be sufficient in amount and of such a character as to penetrate to

* From a paper read before the Engine Builders' Association at Pittsburg, May 22-23, 1902.

the center and cause flowing throughout the mass. This flowing of the metal requires a certain amount of time and the requisite pressure should be maintained throughout a corresponding period. The hydraulic press fills these requirements exactly. The effect of the impact of a light hammer may be simply to draw out the surface metal and leave the center behind to such an extent as to cause cracks or even cavities in the metal and the use of such tools should be avoided. Under the slow motion of the press time is allowed for the molecules of the metal to move easily and the pressure is felt throughout the forging. The center being the hottest, and therefore softest, is squeezed out, and gives a convex shape to the end of the forging. During the forging process, in which there is a gradual reduction in diameter and increase in length, a great deal of work is put into the metal. In order that the metal should be worked at the proper temperature, it is necessary to reheat it a number of times, and every time the press descends upon the metal, the latter is worked under conditions differing from those existing when the press descended upon it before, because it has cooled a little in the interval. As, therefore, when finished, no two parts of the forging have been treated the same, it is natural to suppose that it is full of forging strains. It is also apt to have cooling strains in it, due to the fact that it has been reheated from time to time in different places, as the forging process passes from one end of the piece to the other. These strains, if not relieved, are apt to develop in service, for constituting an initial load they may throw the forging out of true or even cause its complete failure if they happen to act in the same direction as the external working stress. To relieve these various strains, all forgings should be subjected to a final heat treatment called "annealing."

Rationale of Annealing.

The rationale of this heat treatment is worthy of being considered carefully, as it was largely through its non-application that steel gained the reputation of being unreliable. If the rate of cooling of a steel ingot from the point of solidification to coldness is carefully noted it will be seen that the temperature will fall with regular retardation in equal divisions of time until between 1,300 and 1,200 degrees F. a point (depending on the carbon content) is reached where it suddenly stops and for a time either remains stationary or perhaps rises for a short time, and then the same rate of cooling continues as before. This point, where the change of rate takes place, is called the "recalescent" point, and from chemical and physical tests it is known that a change in the structure of the steel occurs here.

The fluid steel begins to crystallize at the point of solidification, and the slower the rate of cooling from there down the larger the crystals will be when the ingot is cold. At the point of recalescence, however, it would seem as if the crystallization, so to say, locks itself, for, if after the ingot has become cold, it is reheated to a temperature below this point, on again becoming cold it will be found that the crystallization is not affected, but if we reheat it a little above the recalescent point, when it is again cold the crystallization will be found to be much smaller than before.

In fact, it is known that if steel is heated slightly above the recalescent point all previous crystallization is destroyed, and a fine amorphous condition is produced at that temperature. As soon as cooling begins again crystallization sets in, and continues until the ingot is cold. As, however, the time of cooling from the recalescent point is comparatively short, the resultant crystallization is correspondingly small. It can be readily understood that when heat treatment can completely change the internal condition of steel, it should bear an important part in the manufacture of forgings made of that metal.

Changes in Metal in the Forging Process.

Consider for a moment the changes which take place in the condition of the metal as it passes through the forging process. Beginning with the cold ingot which having cooled slowly is therefore composed of large crystals it must be reheated to a forging temperature of from 1,800 to 2,000 degrees F., thus passing through the recalescent point, destroying all crystallization and producing an amorphous condition. As soon as it is placed under the forging press it begins to cool, crystallization at once setting in; at the same time, however, the press begins to work upon it.

The work of forging tends to check crystallization just as disturbing water which is below freezing point with delay the formation of ice crystals. The work of forging may or may not continue (depending upon the size and shape of the finished piece) until the temperature has fallen below the recalescent point, but during this time more or less crystallization has occurred, and has been disturbed and distorted. The work of forging has, moreover, proceeded from one end of the piece to the other, the part last worked upon having crystallized considerably before work was applied to it, so that the two ends may be entirely different as far as their internal condition is concerned.

If the forging were now considered to be finished it would be found to be full of pulls and strains about which nothing would be known except that they might amount to several thousand pounds to the square inch. The extent of these strains becomes evident when a forging, finished as above described, has a cut taken from it in a lathe or has a keyway cut on the surface. The strains in the fibers which are cut are relieved, and the piece invariably springs out of "true." Heating the forging to the proper annealing temperature will restore the internal structure to its normal state when an entirely new crystallization is established, and the molecules of the metal are completely at rest. The smaller the crystals in a piece of steel, the stronger will be their adherence to each other, and if the forging after being reheated above the recalescent point is suddenly dropped into a bath of cold oil, no time being allowed during the cooling process for crystals to form, the amorphous condition of its structure at this temperature will be retained and its physical properties greatly increased. This character of heat treatment is called "oil tempering," and should be followed by a mild annealing heat treatment to relieve the metal of any hardening effect due to the cooling process.

In order to temper successfully a piece of steel, great care must be taken both in the process of reheating it and also in cooling it in the bath. In reheating it, the surface metal is apt to expand away from the center and thus cause cracks in the latter, as previously explained; and in dropping it into the cold bath the surface metal is apt to contract onto the center to such an extent as to cause cracks in the former. In order, therefore, to successfully temper a forging, it should be hollow. By taking out the center it can be reheated without danger of cracking, because the center metal is absent and the heat gets into the interior and expands both it and exterior together.

Also in dropping it into the cold bath there is no solid center on which the metal is contracted, and in that way the danger of cracking during the cooling process is eliminated.

An annealed forging has its elastic limit somewhat reduced as compared to its tensile strength, but its ductility is increased very considerably, as shown by its contraction and elongation in test pieces. The elastic limit of an annealed forging is invariably less than one-half of the tensile strength. By "elastic limit" is not meant the point usually determined by the drop of the beam in an ordinary testing machine, but rather the carefully defined point obtained by an electric micrometer which is from 2,000 to 10,000 pounds lower.

It is very evident that the twisting and other manipulation necessary in the forging of irregular shapes, such as solid forged crank shafts, will leave strains in the metal which, unless relieved by heat treatment as above referred to, will cause such failure. The great mortality of this character of forgings is in part due to the fact that they have not received such treatment, either through ignorance or otherwise.

All steel forgings should be finished with good sized fillets at all corners. In such forgings, as connecting rods, special care should be taken to have the four corners of the eye in the head well rounded to resist the tendency to crack at these points should the crosshead or crankpin heat up and bind in the brasses. In piston rods the taper at the ends should not start from a "set down" with a sharp angle.

Solid and Built-Up Crank Shafts.

Some crank shafts are known as "built-up" shafts, the shaft

and pin sections being forged separately and forced into the webs or the webs are expanded by heat and shrunk onto them. Engineers are divided in their opinions regarding the relative merits of solid forged and built-up crank shafts. In the built-up type the various parts are small, and can be carefully worked and, if necessary, bored and oil tempered. The physical properties of the metal can, therefore, be raised to the highest possible limit. The forcing or shrinking process, however, always puts a strain on the metal, which will act as an initial load approaching possibly close up to the elastic limit. In the solid type, on the contrary, a very large ingot would be required, and as such a crooked forging cannot always be oil tempered with safety, the physical properties of the metal cannot usually be raised by heat treatment. The metal, however, can be relieved of all strains by annealing, and if properly designed should work satisfactorily against externally applied stresses for a very long time.

Hollow Forgings.

As stated previously, it is necessary that a forging be hollow in order to temper it. There are two ways of making a forging hollow. The ordinary way of getting rid of the center of a forging is simply to bore it out. After boring, it is tempered, and thus the strength is restored which was taken away with the material which was in the center. Another way of getting rid of the center of large forgings is to forge them hollow. A person who has not considered the subject carefully would naturally think that the first thing to do in making a hollow forging would be to cast a hollow ingot. It has been mentioned that there are various defects which occur in ingots, the most serious of which are "segregation" and "piping;" and that it is in the center and upper portion where those defects occur. If an ingot were to be cast hollow a solid core of firebrick or similar material would replace the center metal and instead of one on the outside there would be two cooling surfaces, one on the outside and one around the core, and the position of last cooling would be transferred to an annular ring midway between these surfaces where the "piping" and the "segregation" would collect. This would not be satisfactory, because the metal there is what must be depended upon for the strength of the hollow forging. It is necessary, therefore, to collect the "piping" and "segregation" in the center and at the top, where metal has been added to the original ingot for the purpose.

Then, having cut off the top and bored out the center, the "piping" and "segregation" are entirely eliminated, and what is left is as sound and homogeneous a piece of steel as can be obtained.

After the hole has been bored in the ingot, the next process is to reheat it, and, as before explained, this process is not as delicate a one as if the ingot were solid. The heat affects the center equally with the exterior and the two expand together and the danger of cracking is not incurred. When the ingot is reheated a steel mandrel is put through its hollow center, and subjecting the two to hydraulic pressure, the metal is forced down and out over the mandrel. Thus an internal anvil is practically inserted into the forging and there is, therefore, really much less than one-half the amount of metal to work on than if the piece were solid.

When the work of shaping is completed the forging is reheated to the proper temperature and then either annealed in the usual manner or plunged into a tempering bath of oil or brine, to set the fine grain permanently that has been established by the reheating. A mild annealing follows to relieve any surface or strains that may have been occasioned by the rapid cooling.

Hollow forgings oil tempered and annealed are considered the best grade of forgings made and any forgings made otherwise, although they may be suitable for the service to which they may be applied, cannot be looked upon in any other manner than as of an inferior grade.

That steel forgings of such high grade were being manufactured for commercial purposes in this country was first brought to the attention of manufacturers generally at the World's Fair in Chicago. Here were exhibited stationary engine forgings which compared favorably with those sent over by European forges. The Ferris wheel shaft, 45 feet long and 32 inches outside diameter with a 16-inch hole through it represented the largest shaft made up to that time. The interest which developed immediately after this exhibition of the quality of product which could be obtained in this country resulted in the establishment of local offices through which these forgings could be obtained. The soliciting of orders, however, at once aroused the latent prejudice still existing against steel forgings and the prices demanded being somewhat in excess of those which wrought iron or ordinary steel forgings could be obtained for prevented at first the very rapid introduction of this product into the commercial field.

Wrought Iron and Steel Engine Fittings.

It hardly seemed necessary to explain to an engineer or any one authorized to purchase and therefore presumably competent that if he wanted material to sustain severe usage in he nature of alternating stresses, to which all forgings are subjected, he should select a material possessing a very high elastic limit. And yet it was not unusual to find that those very people preferred to use wrought iron for their engine crosshead and crankpins and shafts in preference to steel, because, as they said, "steel being crystalline is brittle and snaps off suddenly under such service as that under consideration; while iron having fiber is tougher and yields before breaking." Most of these men knew better, but had not given the subject sufficient thought or they would have perceived that their statements were not consistent. They said that the steel connecting rods they had tried had broken off short without any warning, while rods made of wrought iron had simply bent up and after having been straightened out were replaced as good as new.

These people did not stop to think that a steel rod that broke off short had done so at its ultimate strength or under a stress of from 80,000 to 90,000 pounds per square inch, whereas the iron rod which had doubled up had done so at its yield point of 25,000 to 30,000 pounds per square inch. In other words, their engines with wrought iron rods were failing all over the country under loads about one-third what they were standing up to when supplied with steel rods, and they were blaming the steel for helping them out of their troubles.

Then again they complained that steel shafts and crank pins heated up while wrought iron ran cool. When it was shown them that laboratory experiments showed that the coefficient of friction of these metals was the same and that any difference in heating was caused by local circumstances, such as poor lubrication, excessive pressure, etc., they said they did not care for laboratory experiments. They had an engine in one place with a steel shaft that never would run cool, while another with a wrought iron shaft had never given any trouble and they were passing judgment on their own experience. Persistent exposure of these fallacies gradually brought about a change in sentiment.

It took a long time to persuade people who had seen broken forgings which showed a coarse crystalline section that the metal had not crystallized from shock or vibration in service, but had been forged in such a manner that the crystalline condition of the ingot from which the forging had been made had not been changed by the forging process or by subsequent heat treatment. And these are the people even now who consider themselves conservative, who would rather have their forgings made of a mild steel which is weak than a higher carbon steel which is strong, simply because the old ideas are not yet eradicated from their minds. Tests were made at the government testing bureau at Watertown by rapidly bending bars forward and backward within their elastic limit with the following results, and these have given engineers an idea of the comparative endurance of wrought iron, steel and nickel steel in such service as that to which crank pins, shafts, etc., are subject. Under a fiber stress of 40,000 pounds per square inch,

Wrought iron breaks after	59,000	alternations of stress.	
.15 per cent carbon steel breaks after	170,000	"	"
.25 " " " "	229,000	"	"
.35 " " " "	317,000	"	"
.45 " " " "	676,000	"	"
3¼ per cent nickel-steel, carbon .25 to .30 per cent.	1,850,000	"	"
4⅜ per cent nickel-steel, carbon .25 to .30 per cent.	2,360,000	"	"
5⅛ per cent nickel-steel, carbon .25 to .30 per cent.	4,370,000	"	"

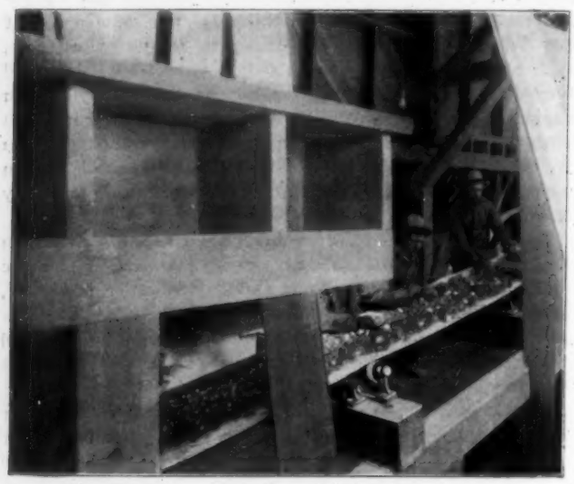
Engineers and those whose duties it is to purchase forgings have been led to see that they should specify definitely the strength that they wish the material to possess and then to follow up the specifications by inspection to insure receiving what has been ordered.

During the past few years a series of specifications have been drawn up and adopted by the International Association for Testing Materials which is composed of engineers, manufacturers, companies, associations, societies and any individual or organization interested in obtaining standards. The standard specifications for forgings are herewith given for convenient reference and the physical properties mentioned are obtained from test bars drilled from a full sized prolongation, forged on one end of the forging, these test bars being of the United States Navy standard size, ½-inch diameter and 2 inches long between gauge marks.

Class of Steel Forgings.		Tensile Strength. Pounds per Square Inch.	Elastic Limit. Pounds per Square Inch.	Elongation. Percent	Contraction of Area Percent.	Dimensions of solid and hollow forgings in which the physical qualities mentioned on the opposite page are guaranteed.
Nickel Steel Oil-Tempered.	(1)	95,000	65,000	21.00	50.00	Solid or Hollow forgings, no diameter or thickness of section to exceed 3 ins.
	(2)	90,000	60,000	22.00	50.00	Solid forgings of rectangular sections not exceeding 6 inches in thickness, or Hollow forgings, the walls of which do not exceed 6 inches in thickness.
	(3)	85,000	55,000	24.00	45.00	Solid forgings of rectangular sections not exceeding 10 inches in thickness, or Hollow forgings, the walls of which do not exceed 10 inches in thickness.
Nickel Steel Annealed.	(4)	80,000	50,000	25.00	45.00	Solid or Hollow forgings, no diameter or thickness of section to exceed 10 ins.
	(5)	80,000	45,000	25.00	45.00	Solid forgings, no diameter to exceed 20 inches or thickness of section 15 ins.
	(6)	80,000	45,000	24.00	40.00	Solid forgings over 20 inches diameter.
Carbon Steel Oil-Tempered.	(7)	90,000	55,000	20.00	45.00	Solid or Hollow forgings, no diameter or thickness of section to exceed 3 inches.
	(8)	85,000	50,000	22.00	45.00	Solid forgings of rectangular sections not exceeding 6 inches in thickness, or Hollow forgings, the walls of which do not exceed 6 inches in thickness.
	(9)	80,000	45,000	23.00	40.00	Solid forgings of rectangular sections not exceeding 10 inches in thickness, or Hollow forgings, the walls of which do not exceed 10 inches in thickness.
Carbon Steel Annealed.	(10)	80,000	40,000	22.00	35.00	Solid or Hollow forgings, no diameter or thickness of section to exceed 10 ins.
	(11)	75,000	37,500	23.00	35.00	Solid forgings, no diameter to exceed 20 inches or thickness of section 15 ins.
	(12)	70,000	35,000	24.00	30.00	Solid forgings over 20 inches diameter.

JEFFREY SORTING BELT CONVEYOR.

The accompanying illustration shows a Jeffrey Century belt conveyor used as a sorting table at the mines of the Colorado Fuel & Iron Co. This outfit consists of an extra wide Century conveyor belt, having its carrying side reinforced with an extra thickness of a special rubber covering for resisting the abrasion of the material. The belt is supported on special troughing carriers, concaving the belt sufficiently to prevent the material from rolling off. The belt is operated



JEFFREY SORTING BELT CONVEYOR.

at a moderate speed, which enables the pickers to take the impurities from the product while in transit.

These sorting tables are used successfully for different purposes, also for carrying large or small quantities of material from one place to another. They can be operated horizontally or on an incline up to 25 or 30 degrees if desired. This conveyor was furnished by The Jeffrey Manufacturing Co., of Columbus, O., which supplies this class of material for the handling of coal, ores, sand, quartz tailings, crushed stone, sulphite chips, clay, and for a variety of other purposes. The company also manufactures a complete line of chain elevating, conveying and power transmission machinery.

ENGINE BUILDERS' ASSOCIATION.

The semi-annual convention of the Engine Builders' Association of the United States was held in Pittsburg Thursday and Friday, May 22 and 23. There was a fair attendance of the members and of representatives of allied interests. The first session was held at the Hotel Schenley, the convention headquarters, on Thursday afternoon. Four papers were presented and were discussed at length. H. F. J. Porter, New York representative of the Bethlehem Steel Co., read the first paper entitled "Engine Forgings." It was illustrated with stereopticon views and was extremely valuable in the amount of information imparted on the history and the manufacture of high grade forgings. E. M. Tingley, of the Westinghouse Electric & Mfg. Co., Pittsburg, Pa., followed with a paper entitled "Engine Requirements for the Parallel Operation of Alternators." John B. Berryman presented a paper on "Piping Material for Steam Plants," which was followed by a paper by H. M. Longwell, also of he Westinghouse Electric & Mfg. Co., on "Requirements for Paralleling of Alternators as Viewed by Engine Builders."

On Friday morning an executive session of the organization was held and in the afternoon the party visited the plants of the Westinghouse Machine Co. and the Westinghouse Electric & Mfg. Co., at East Pittsburg. The convention closed with a banquet at the Schenley in the evening. The following were in attendance:

George E. Gaskell, manager Philadelphia office, Ames Iron Works, Oswego, N. Y.
Arthur L. Merrian, Ames Iron Works, Oswego, N. Y.
Thomas C. Wood, Ball & Wood Co., New York.
C. A. Gates, Russell Engine Co., Massillon, O.
W. M. Taylor, Chandler & Taylor Co., Indianapolis, Ind.
H. A. Chuse, Chuse Engine Works, Mattoon, Ill.
Prof. J. E. Sweet, Straight Line Engine Co., Syracuse, N. Y.
J. H. McGregor, Goldie & McCulloch Co., Ltd., Galt, Ont.
A. K. Spotton, Goldie & McCulloch Co., Ltd., Galt, Ont.
C. B. Little, Brownell & Co., Dayton, O.
Mr. Sembower, Orr & Sembower, Reading, Pa.
S. H. Payne, The Payne Co., Elmira, N. Y.
F. M. Rites, mechanical engineer, Ithaca, N. Y.
H. L. Ide, A. L. Ide & Sons, Springfield, Ill.
D. M. Brier, Ball Engine Co., Erie, Pa.
F. A. Millard, Murray Iron Works, Burlington, Ia.
W. C. Kerr, Westinghouse, Church, Kerr & Co., New York.
E. H. Griffith, Westinghouse, Church, Kerr & Co., New York.
H. F. J. Porter, Bethlehem Steel Co., New York.
E. M. Tingley, Westinghouse Electric & Mfg. Co., Pittsburg.
H. M. Longwell, Westinghouse Electric & Mfg. Co., Pittsburg.

THE FLYING SHEAR.*

BY V. E. EDWARDS, WORCESTER, MASS.

In the engineering office of a past president of this society the question of cutting metal bars while in motion had been so carefully discussed that in 1892 a carte blanche order was accepted for a mill and equipment which should accomplish unprecedented results. The problem was to take 2½-ton ingots after they had been worked down on a 34-inch reversing mill to a long bloom having a cross section of 4 inches by 5 inches, crop the first end of the piece which was then some 80 feet in length, roll the entire ingot to a section 1½ inches square, cut it up into any desired lengths from 15 to 30 feet, cool the severed billets and load them on cars. The stipulated crop waste was one crop and one short from the 4 inches by 5 inches bloom. This meant rolling a 1½-inch square section over 600 feet long and cutting it into twenty or more billets 30 feet long, or shorter if desired.

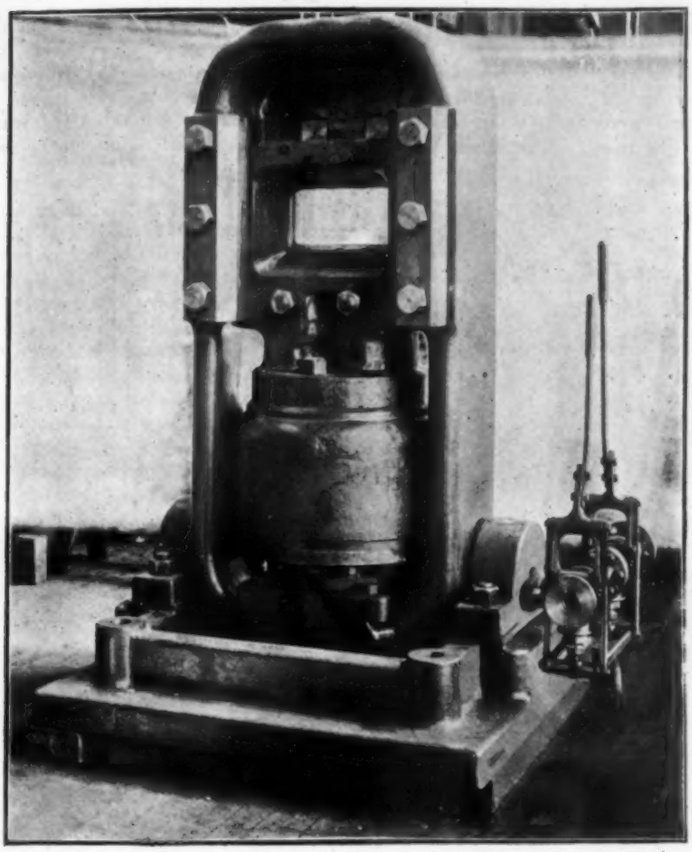


FIG. 1.—ORIGINAL PRELIMINARY SHEAR BUILT FOR JONES & LAUGHLINS IN 1893. This is trunnioned at the base, allowing the knives to swing through an arc about fifteen inches long. The hydraulic connection is made through the trunnion, as is clearly shown. The return stroke on this shear was made by gravity.

The ground available was a triangular space scarcely 100 feet on its longest side. Within this 100 feet must be placed the connecting drawbridge table, the preliminary shear, the mill, the finishing shear and the elevator for taking the severed billets to a high overhead conveyor, which should carry them to a distant elevated cooling bed, from which they would be loaded on cars, by gravity. These conditions, of course, called for a continuous mill and meant that the billets must be cut while in motion and close to the finishing pass.

The mill problem was interesting. The shear problem had in addition the exhilaration of pioneer work. The preliminary shear must be able to cut 4 inches by 5 inches hot steel, and to do this cutting while the bloom was either stationary or in motion. The shear used is clearly shown in Figs. 1 and 5. This is a simple hydraulic shear trunnioned at the base to permit the knives to travel with the moving bloom during the instant of cutting.

The shear at the finishing end of the mill required much study. The shear knives must move horizontally as fast as or a little faster than the billet. This horizontal movement must be entirely independent of the billet. The cutting must be done in a small fraction of a second; a clear passage must be made instantly for the oncoming billet; the shear must complete its cycle and be back in its original position ready for the second cut, all in less than one second. The moving parts could not be made light, as the shear has to cut not only 1½ inches square, but any size up to 9 square inches section, and the steel was liable to be high carbon and quite cool.

From many designs, that shown in Fig. 2 was chosen. Fig. 3 shows the elementary idea more clearly. The two most noticeable features of this design are, first, the cutting is incidental to the forward movement of the shear; second, one knife is hinged in such a manner as to swing freely out of the way of the oncoming billet as soon as the cut is completed. The cutting stroke is made by a hydraulic cylinder in connection with a steam intensifier.

As the first end of the advancing billet passes between the knives to crop the first end, an attendant presses a small lever. This releases the steam pilot valve, which in turn opens the main steam valve. The steam piston rises, forcing the confined water into the shear-operating cylinder. The stroke of the cylinder is 24 inches. Of this 24-inch stroke, about 8 inches are used in picking up the clearance and in getting the shear knives to traveling as fast as the billet. About 8-inch stroke is used for the actual cutting, and the remaining 8 inches are used for clearance and for stopping the moving parts. The instant the shear begins to slow, the oncoming billet quietly pushes the hinged upper knife out of its path. Automatic link connections reverse the steam valves, and the return stroke is made by means of a small plunger under constant hydraulic pressure. The upper knife swings back to its original position while the return stroke is being made. The swinging knife is so heavy that a dash pot is used to prevent slamming.

After cropping the first end, all subsequent cuts are made automatically by the advancing end of the billet passing under a trigger placed 30 feet from the shear, or closer if shorter lengths are wanted. The first machine was a complete success, and has been in constant use about nine years, with only ordinary repairs. The next shear of this type was a small one, for cropping the first end of bars while running between consecutive passes of a continuous mill and for cutting and diverting the bar in case of a cobble. See Figs. 3 and 4. This is operated by a boy, who snaps the trigger of the small piston valve of the operating steam cylinder. Quite a number of these have been installed, and they have become an important adjunct in rod, hoop, and merchant mills. The original shear of this size has been at work continuously for some seven years.

The billet mill and shear gave Jones & Laughlins such complete satisfaction that the Carnegie Steel Co. ordered a similar equipment to be used as an outlet for small billets from their 21-inch mills at Duquesne. To operate this shear, a direct-connected steam cylinder was used somewhat similar to the small shear which had given such good results. See Fig. 5. The success of this installation resulted in the Carnegie Co. placing an order for a second mill and shear for finishing the output of their new 40-inch mill at Duquesne. About the same time the National Steel Co. ordered a similar equipment for their Ohio plant at Youngstown. More recently the Republic Iron & Steel Co. have ordered five shears for their new plant in the same busy city. The shear at the Ohio plant is the fastest running billet shear as yet installed; it is regularly cutting 1½-inch steel billets at a rate of 2,000 tons per 24 hours, provided the mill is kept full.

Very high speed work calls for different treatment. In 1894 the Union Iron & Steel Co., of Youngstown, O., placed a blanket contract for equipment to roll cotton ties from a billet weighing 225 pounds (the common practice in rolling ties at that time was to use a billet weighing 15 pounds). In this mill everything was without precedent, continuous furnace, continuous roll trains, continuous shearing, and continu-

*Read at the Boston meeting, (May 27-30) of the American Society of Mechanical Engineers.

ous cooling. It is needless to say that much trouble was experienced. Perhaps the most serious and expensive annoyance was the discouragement of the workmen by their doubting and pessimistic friends. In this mill it was necessary to cut hot cotton tie seven-eighths of an inch in width by five one-hundredths of an inch in thickness, and to do this cutting while the hot tie was traveling at a speed of some 25 feet per second. The cutting in itself did not give much trouble, neither did falling from the roof injure our traditional Irish friend. In both cases the trouble all came in the stopping.

Think of having some 150 hot, limber cotton ties, 11 feet 6 inches long, limp almost as wet tissue paper, shot out endwise in one minute with no clearance between the ends. The momentum would slide them over 20 to 40 feet of rough iron floor. Let the least obstruction get in the way and a large pile of scrap was instantly made. These difficulties, however, were soon overcome, and the arrangements used gave excellent satisfaction for cotton tie.

The shear used is shown in Fig. 6. The knives were carried on two conical drums geared together. In order to get long lengths without having large drums, small drums were used with the upper one carried in a hinged frame, the free end of this frame was supported through connecting rods by eccentrics on a shaft which was driven at one-half, one-third, or one-fourth of the number of the revolutions of the drum. By this means the knives did not quite meet, and consequently did not cut the thin tie except on multiple revolutions. By shifting the position of the knives on the cone, and by the use of change gears on the eccentric shaft, any length desired could be cut accurately.

For barrel hoop it appeared desirable to cool the hoop before allowing the severed strips to overlap, otherwise the hoop would look streaked and not have the beautiful blue finish acquired by uniform cooling with free exposure to the air. It was also desirable to be able to carry stocks in coils from which small orders could be shipped promptly, cut to any specified length. These conditions led to air-cooling the hoop by looping it out on an advancing apron and then reeling or coiling the hoop as it was delivered at the far end of the apron after it was sufficiently cool to have acquired and to hold its finish. These tightly wound coils were then either placed in stock or cut up at once on shears entirely apart from any interdependence with the rolling.

The shears shown in Figs. 7 and 8 were quite compact and readily adjustable. The leading feature of these shears is the simple method of getting rotary shears to cut long lengths without complication or large diameters. This was accomplished by making the pitch diameter of the upper and lower cutting heads, together with their gearing, of different diameters. For example: If the gears have the ratio of 4 to 3, it will be seen that the knives would come in opposition but once in three revolutions of the large head, or four revolutions of the small head; this allows the diameter of the cutting heads and gears to be reduced in the same proportion.

Cutting up material while in motion is not broadly new. We are all familiar with many appliances for this work, ranging from the old hay or feed cutter to that imposing organization, the modern newspaper press. Cutting metal bars while in motion had been accomplished, for example, in rolling horse shoes and some other lines. Yet, considering the state of the art at that time, much credit is due Messrs. Jones & Laughlins for the firm confidence with which they installed an expensive and elaborate continuous mill and accessories while fully realizing that the success or failure of the whole equipment was entirely dependent on something so little demonstrated as the flying shear.

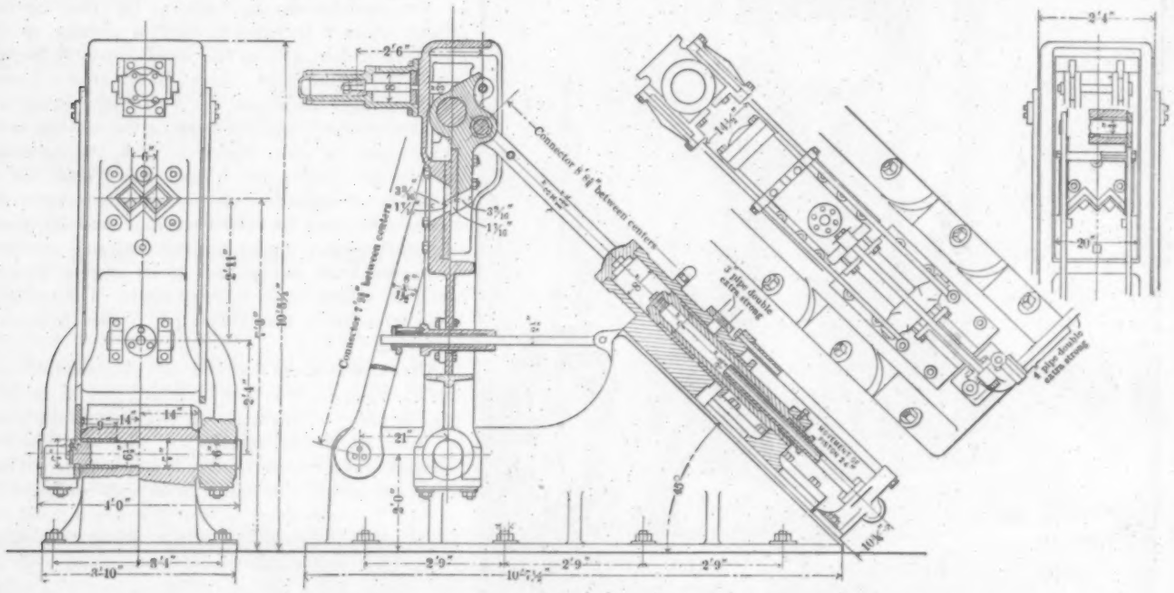


FIG. 2.—SECTIONAL ELEVATION OF ORIGINAL FLYING SHEAR YET IN USE BY JONES & LAUGHLINS.

The Goulds Mfg. Co., Seneca Falls, N. Y., reports a very busy season in all departments of its plant. The business in this company's line of triplex power pumps has grown so rapidly that it has been found necessary this year to add a very large extension to the new factory completed last year. This whole factory is equipped with modern machinery and permits of greatly increased output. The company is furnishing every size ranging from pumps for domestic water supply to large machines such as are supplying water at the Crystal Palace, London, for electric fountains. A catalogue is now in preparation, relating to these triplex power pumps, giving full information in regard to the different types and sizes, their application for mine work, mill work and every service. It will be mailed to those who apply for it.

An important improvement has been made in Forbes die stocks, manufactured by the Curtis & Curtis Co., of Bridgeport, Conn. This is the adjustment of the shell or casing, so that the wear of gear is taken up. In many machines for cutting and threading pipe the gear wears itself loose in the shell after a time, so that a perfectly straight thread is not easily obtained. This difficulty is overcome in the Forbes die and stock. The dies used are cheaper than solid dies and are said to be much more durable. All parts of the machine are interchangeable.

The annual meeting of the stockholders of the Mahoning Foundry & Machine Co. was held at Youngstown, O., last week and the following elected directors: Frank D. Runser, G. M. McKelvey, L. E. Cochran, Mason Evans and Frederick G. Evans. Frank D. Runser was made president; Mason Evans, vice president; Frederick G. Evans, secretary and treasurer. The new plant is expected to be in operation in July.

PIPING MATERIALS FOR STEAM PLANTS.*

BY JOHN B. BERRYMAN.

Designing a system of steam piping is properly the province of the professional mechanical engineer. The manufacturer is interested in the design only so far as it may adversely affect his product. He has, however, a vital interest in the quality and type of the materials specified, as in the event of failure of any part of the system he usually bears the lion's share of the blame. It is obvious that the manufacturer of any article whatever should have a knowledge of service conditions, if he is to attempt to fulfill such conditions satisfactorily. Having such knowledge, it becomes necessary, when designing valves, fittings, or other steam appliances, to draw upon the usual sources of engineering information as to strength of material, etc., supplementing this by a broad series of shop tests to determine whether the theoretical information is borne out by facts. It is one thing to think you are right and quite another to know you are right because you have demonstrated it. The Crane Co. has carried on a series of such tests for several years, principally covering the field of high pressure steam piping, and as briefly as possible I will give you the results.

Pipe.

Ordinary commercial pipe, 12-inch and smaller, appears to have an ultimate bursting strength in excess of 1,500 pounds per square inch, provided the weld is perfect. We have tested some lengths of 10-inch pipe taken at random out of stock to 2,300 pounds per square inch; 8-inch pipe to 2,000 pounds; 12-inch to 1,500 pounds; 16-inch 3/8-inch thick to 800 pounds; 24-inch 3/8-inch thick to 600 pounds—all without rupture or apparent distortion. We have tested from time to time thousands of pieces of all sizes, 20-inch and smaller, under 800 pounds per square inch, so that as far as strength is concerned, there appears to be no reason why pipe heavier than standard should be used on power plant work. In plants where the feed water is bad, it is economy to run the feed lines of extra strong pipe, and this has become quite a common practice even where the water is comparatively good.

Flanged Joints.

We have had occasion to make nearly every possible style of joint, but the major portion of our orders are for either screwed or shrunk flanges, in the proportion of about 85 percent screwed to 15 percent shrunk. Considering everything—first cost, ease with which a line can be altered or repaired, freedom from troublesome leaks and strength against tensile strain—we think a good screwed joint is superior to any other. We use two lengths of threads, the standard up to 125 pounds and a somewhat longer full taper thread for pressures up to 250 pounds. They compare as follows:

	Standard.	Extra Heavy
4-inch length	1 3/16	1 1/4
6-inch "	1 7/16	2
8-inch "	1 5/8	2 1/16
12-inch "	2 1/16	2 5/16
16-inch "	2 7/16	2 7/8
20-inch "	2 3/4	3 1/4

To determine the holding power of threads we made a large number of tests commencing with the long threads and gradually cutting them away. Results showed that the strength of the joint was limited by the strength of the cast iron flange. In no case was the thread stripped. On a 10-inch pipe the threads were reduced until barely five threads were in contact instead of fourteen as called for by our standard tables. On the test the flanges broke at 650 pounds per square inch, all threads being intact. This question of the holding power of threads is one that we frequently have to explain, as some people are under the impression that under high pressure the threads are likely to strip. Calculation of the amount of metal which would have to be sheared off before the joint parted will effectually still any fears in this direction. Taking for example our standard length of thread, 8 threads per inch, the result works out as follows:

Size.	Length of Threads.	Metal in Contact. Square Inches.	Sectional Area of Full Weight Pipe.
8-inch	1 5/16	42 inches	8.396
12-inch	2 1/16	77 "	14.579
16 3/4-inch	2 7/16	116 "	18.41

If we assume that the shearing strength is one-half of the tensile then it is evident that the holding power of the threads is fully three times greater than the ultimate strength of the pipe. Mr. R. T. Crane had a great number of tests made upon runs of 8-inch pipe, using regular wrought iron couplings, for the purpose of demonstrating that long threads were not essential to strength. The final test was made with threads only 3/4-inch long, barely six threads being in contact. The pipe was tested to 1,000 pounds per square inch, the pressure being held on the line for a day. If one did not stop to consider the subject carefully it would certainly look extremely dangerous to carry 1,000 pounds on a line with only half the usual number of threads, but as a matter of fact there were about 20 square inches of metal in the threads, against 8.396 in the pipe, and the joints were strong enough to carry the line to the limit of its bursting strength.

The object in making threaded joints for high pressure work longer than standard is not to gain greater tensile strength, but to reinforce the pipe by a deep hub and by throwing a large number of threads into contact to guard against the flanges being loosened by the continual vibrations of a high pressure line.

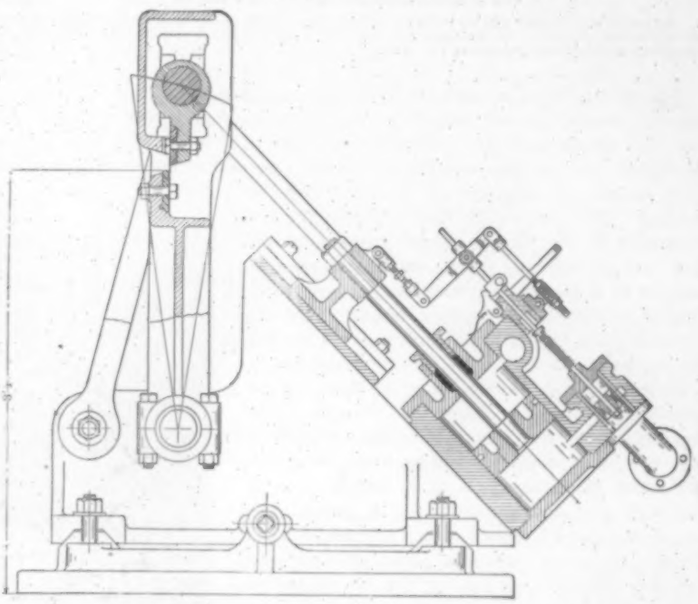


FIG. 3.—SECTIONAL ELEVATION OF ORIGINAL SMALL FLYING SHEAR.

The upper knife is free to swing about the large cross-head pin. This pin has a combined horizontal and vertical motion, as indicated by curved line.

It is important to have the pipe screwed completely through the flange, first to guard against the vibration and secondly to make a bearing for the gasket upon the end of the pipe and close the thread against the oxidizing action of the steam. It is our practice to screw the flange on with power, until the ends of the pipe project about 1-16 inch. The piece of pipe is then swung in a special lathe and the projecting ends cut off, a light cut being then taken on the face of each flange to insure them being parallel and at right angles to the true longitudinal axis of the pipe. This refacing operation is absolutely essential to a first class job. Pipe is rarely perfectly straight, and even if it were, there is the chance of the thread on the pipe, or in the flange, being cut on a slight angle, which in a long run might throw the line out considerably, or in a run with a number of joints the multiplication of a very small error in each one, will aggregate a large one. Each pipe should drop into place naturally without undue strain upon the flanges, and this can only be accomplished by the refacing method.

*Read at the Pittsburg meeting of the Engine Builders' Association, May 22-23, 1902.

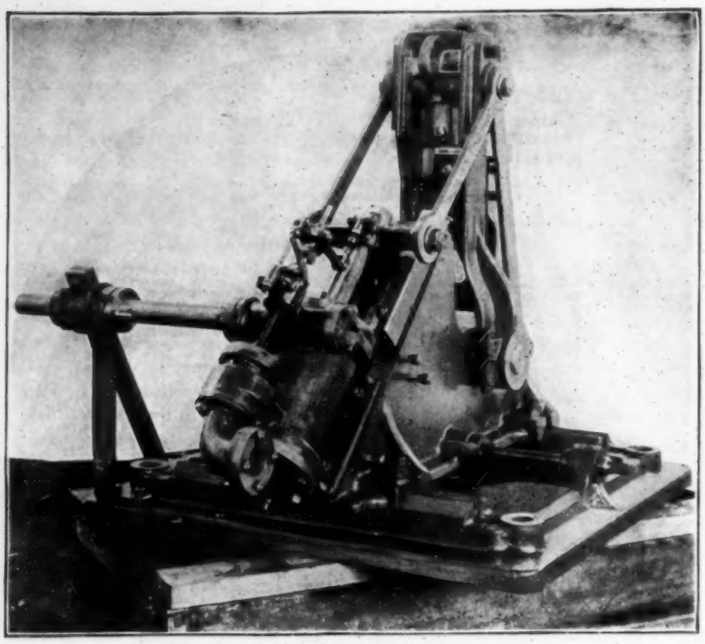


FIG. 4.—ORIGINAL SMALL FLYING SHEAR.

As installed between passes of the first continuous cotton-tie mill and since adopted as an important adjunct to continuous rod mills for cropping the first end of bars between the roughing and finishing parts of the mill.

The shrunk joint is made in the following manner: The pipe is rounded up and calipered. The flange is then bored out to a shrinking fit and after being brought to a red heat, is slipped over the pipe and the end of the pipe peaned over. The flanges are then turned up in a lathe as before described. It is claimed for this joint that the full thickness of the pipe is carried through to the face and consequently it will stand more pressure and have a longer life than the screwed joint. Yet it is certain that against tensile strain the screwed joint will hold all the pressure that can be put on it. In fact, with end and blind flanges sufficiently strong a pipe may be burst under pressure without injuring the threads, while against lateral strain, expansion or vibration, a screwed joint properly made is, if anything, better. The chief objection to a shrunk joint is its high cost and the fact that a gasket must cover the end of pipe in order to make a tight joint. There are very few joints of this kind, whether they are shrunk on hot or peaned on cold, which will not leak if the end of the pipe is exposed.

Cast iron flanges riveted on are very undesirable, as they almost invariable leak through the rivet holes when subjected to the vibration of a steam line in active service.

Facing Flanges.

We are called upon to face flanges in various ways, the principal being straight face smooth, straight face corrugated, male and female, tongue and groove and 1-32 inch raised face inside bolt holes. For pressure of 180 pounds or less, our experiments go to show that a straight concentrically corrugated face will hold a Rainbow or copper gasket without trouble. We have made repeated tests with pressures up to 1,000 pounds without blowing out the gasket. There is no manufacturing objection to male and female facing, other than increased first cost, and the fact that such goods are not carried in stock and there is always a delay in filling orders. But operating engineers have frequently complained to us about the difficulty they experience in changing gaskets, if for any reason it is necessary to break in on the line. It is a severe task to spring a large heavy pressure line apart sufficiently wide to permit of removing the old gasket and putting in a new one.

The tongue and groove joint is similar to the male and female except that the recess is not carried out to the inner wall of the pipe. The end of the pipe is exposed to the pressure all times and the joint is undesirable on that account.

Flanges.

There are two recognized standards for cast iron flanges at present in use. It has taken some time to bring about uniformity but all the large manufacturers have now agreed to adopt the tables. We attach to this paper dimension sheets covering all details. One table is for steam pressures up to 125 pounds. This table was adopted by a joint committee of the American Society of Mechanical Engineers, the Master Steam Fitters' Association and the manufacturers. [It has already been printed in these columns.—Ed.] The other table, for pressures up to 250 pounds, was adopted at a meeting of manufacturers held in New York on June 28, 1901. It is generally referred to as the "Manufacturers' Standard." It would be a great convenience to all manufacturers of piping material and their customers, if the Association of Steam Engine Builders would adopt these standards for all piping connections. The diversity in diameters and drilling of flanges on engines, pumps, condensers, is the cause of much trouble and delay.

Flange Fittings.

We manufacture these fittings in three weights. The lightest is for very low pressures, such as exhaust or condenser connections; the second for standard pressures up to 125 pounds, and the heaviest for high pressure lines up to 250

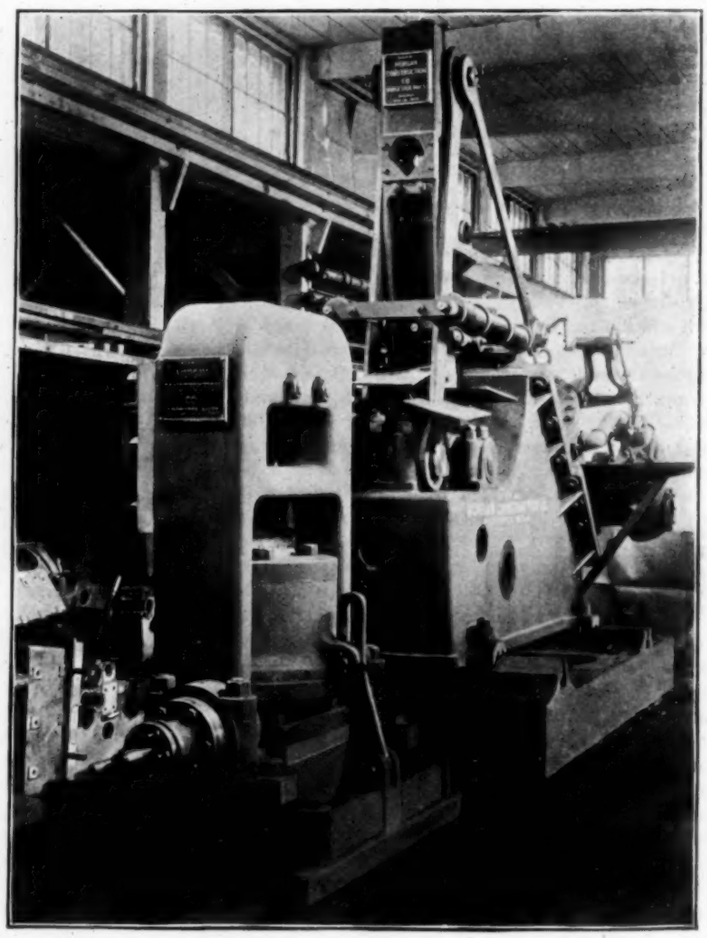


FIG. 5.—FIRST PRELIMINARY AND FLYING SHEARS BUILT FOR CARNEGIE STEEL CO.

On the preliminary shear is seen the simple lost motion link, by aid of which gravity returns the shear to its upright position, after being tilted over by the bloom moving while bei ng cut.

pounds per square inch. The thickness of body metal in the three styles is as follows:

	Light.	Standard.	Extra Heavy.
6-inch	.....	15/16 inch	3/4 inch
10-inch	.....	7/8 "	1 1/16 "
12-inch	1/2 inch	1 1/16 "	1 "
16-inch	5/8 "	1 "	1 3/16 "
20-inch	11/16 "	1 1/16 "	1 5/16 "
24 inch	3/4 "	1 1/4 "	1 1/2 "
30-inch	7/8 "	1 1/2 "	.....
36-inch	1 "	1 3/4 "	.....

Applying to these fittings the well known formula for cast iron pipe, $P = \frac{2 T \times 8}{D} \frac{S}{5}$, in which P equals pressure, T equals thickness of metal, D equals diameter, S equals tensile strength and 5 equals factor of safety, it will be seen that we have largely increased the factor of safety to cover possible defects in the metal, core shifts, or other imperfections. For example, solving the factor of safety $F = \frac{2 T S}{P D}$, and in the case of a 16-inch extra heavy fitting to carry 250 pounds working pressure we have 1 3-16-inches metal with a tensile strength of 20,000 pounds, then $F = \frac{2 \times 1.18 \times 20,000}{250 \times 16} = 11.80$. In a 12-inch extra heavy fitting, F equals 13.33, and in a 24-inch extra heavy fitting F equals 10.

An excess of strength is desirable, as the fittings have to stand the strains incident to changes in temperature, vibration and settling of the pipe line. These conditions make it necessary to use rather heavy flanges and of necessity body metal thick enough to carry the flanges without shrinkage strain. We have also demonstrated by a large number of tests, that a formula which may be fairly accurate for cylinders, is subject to some modification when applied to tees, elbows, and crosses. In fact the majority of the fittings burst at pressures considerably below that indicated by theory. In all cases, however, we have a safety factor high enough, and the thickness of metal may be considered well adapted to the purpose for which the fittings are used.

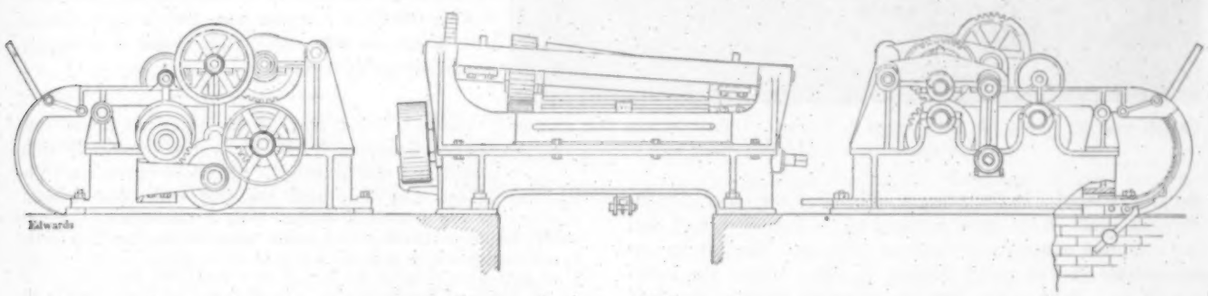


FIG. 6.—CONICAL ROTARY SHEAR USED FOR CUTTING HOT COTTON-TIE DIRECT FROM THE FINISHING PASS.
The right-hand elevation clearly shows the upper knife drum adjustably controlled to cut only on multiple revolutions.

Valves.

In valves the call is now for straightway type. A number of angle valves are still used on boiler or engine leads, but a globe valve on a plant of any magnitude is very exceptional. They are still used freely on small lines and wherever it is necessary to throttle the steam. Beyond this the gate valve has so many advantages that it has practically secured the market. To cover the range of power plant work we have had to build four lines:

(1) Low pressure for exhaust and condensing lines.
(2) Standard for pressure not exceeding 125 pounds.
(3) Medium for pressure not exceeding 150 pounds.
(4) Extra heavy for pressure not exceeding 250 pounds.

Upon the low pressure line we have not made very exhaustive tests, further than to ascertain that the valves are tight at 50 pounds per square inch. The other lines have been thoroughly exploited on all except the very largest sizes. Boiling down the results and striking general averages we arrive at the following:

Standard valves 4-inch to 8-inch will burst at about 700 pounds.

Standard valves 10-inch to 16-inch will burst at about 600 pounds.

The larger sizes we have not burst, but have tested the 18-inch to 450 pounds and 20- to 30-inch to 300 pounds pressure without injury.

The medium valves will withstand a pressure of about 500 pounds in excess of the standard.

Extra heavy valves 4- to 8-inch burst at 1,600 to 1,900 pounds.

Extra heavy valves 10-inch to 16-inch burst at 1,200 to 1,500 pounds.

The larger sizes have not been destroyed but the 18-inch has been subjected to 350 pounds and the 20 and 24-inch to 600 pounds without injury. The same thickness of body metal is used in the valves as given for flanged fittings, except that all gate valves have the metal increased at the top of the body to carry any settling strains.

The next point to ascertain was the maximum load which could be applied to the discs without causing a leak. This load was found to be in nearly all cases 80 percent of the ultimate strength of the body. It must be borne in mind that all pressure valves mentioned were of the solid wedge type. It is not possible to obtain equivalent results from parallel seated double disc valves, for the reason that the latter have two comparatively light faces set out by an internal wedging mechanism and the face exposed to pressure will spring under a load very much less than can be sustained by a solid wedge.

It has been the custom for many years to rib the bodies of high pressure valves. The ribs give a massive appearance and are desirable on that account from the standpoint of the selling department, but they serve no good purpose mechanically and are a detriment instead of an advantage. The distribution of metal is so uneven that shrinkage strains are set up all along the corners where the ribs join the body, making the metal porous. A ribbed valve will not stand any more pressure than one with a plain body, and the only point which might be argued in favor of the ribs would be that they stiffen the valve against strains due to settling in the line. It is not, however, very logical to guard against a remote possibility by setting up a number of internal strains, especially where a plain bodied valve can be designed which will take care of all strains reasonably to be anticipated. We have concluded to abandon the ribs altogether and shall hereafter only make valves of that style on special orders.

For high pressure work we always recommend valves having outside screw and yoke, stationary wheel and rising spindle. In fact, for any service this type is preferable, except on the very large sizes where the great height from top of spindle when open, to the bottom of the valve, is a serious objection. The advantages over the internal screw valves are:

(1) The stem is an indicator showing at all times the position of the disc.
(2) The thread on the stem is never in contact with the steam and can be properly lubricated.
(3) There is no thread in the wedge.

By-passes should be used on valves 8 inches and larger when high steam pressure is used. The load on the wedge of an 8-inch valve at 180 pounds pressure is 9,047 pounds and on a 16-inch valve 36,190 pounds. It is obvious that under such loading the pressure must be partially equalized on each side of the wedge before the valve can be opened with facility.

Pipe Bends.

Bends are being used very freely. By their use all expansion strain can be taken up and the number of joints ma-

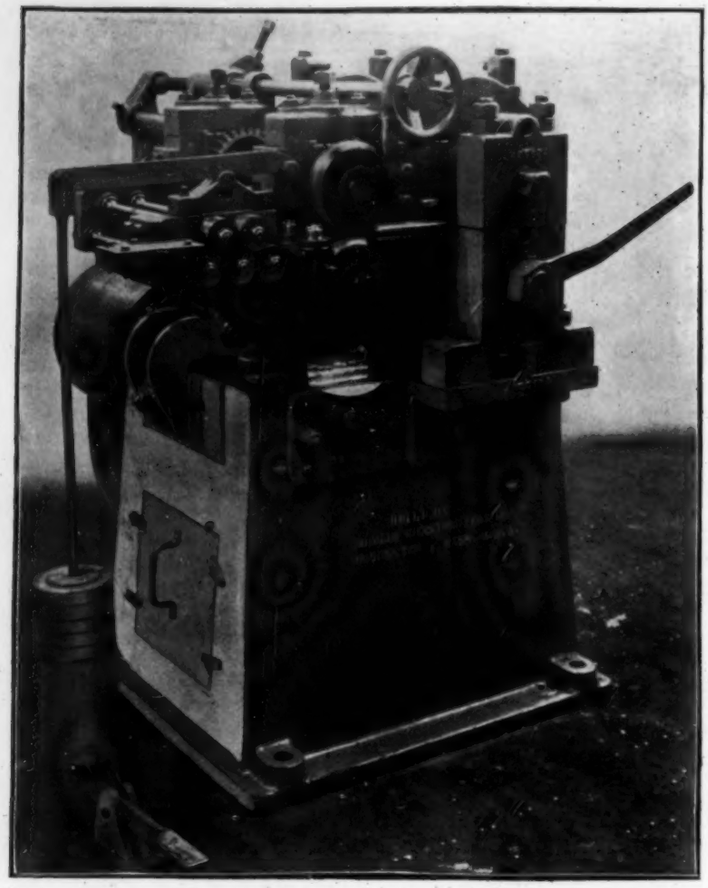


FIG. 7.—FRONT VIEW OF DIFFERENTIAL ROTARY FLYING SHEAR FOR EITHER HOT OR COLD HIGH SPEED CUTTING.

terially reduced. In the process of bending the outer circumferential wall of the pipe is stretched, as the inner wall will not compress to any extent without buckling. There is also an appreciable loss of metal through scaling. Unless the bends are of very short radius they are generally made of standard pipe for pressure of 125 pounds or less, full weight pipe up to 175 pounds, and extra heavy pipe for higher pressures. If the bends are used to take up expansion it is well to make them of pipe as light as is consistent with safety. The shape of the bends will determine generally the material which ought to be employed, as in those with large radius the stretching of the metal may be almost disregarded.

In conclusion we strongly advocate the use of staple, catalogued goods wherever possible. Such a variety of fittings and valves may be obtained now from stock that there does not seem to be any necessity for the enormous number of specials which we, in common with other establishments in our line, are daily called upon to make. Many times these specials serve no other purpose than to put into concrete form some whim or fad of the engineer in charge of the installation. Specials are often the product of theory only. Staples result from theory and experience. A purchaser who buys a staple article from a reputable house has the assurance that such an article has been thoroughly tried out, possibly hundreds or thousands of times, under conditions similar to his own. In addition he can get reasonably prompt shipment and the benefit of a lower price due to special machinery and the elimination of pattern labor.

The firm of Scholl & Semple, Youngstown, O., have leased the present site and buildings of the Mahoning Foundry & Machine Co., Youngstown, O., and will install therein a plant for doing high pressure steam fitting for blast furnaces, steel plants, etc. A large amount of new machinery will be installed to carry on this work. The Mahoning Foundry & Machine Co. will shortly be located in its new plant.

Obituary.

John Collins, superintendent of the Old Meadow plant of the American Sheet Steel Co., Scottdale, Pa., died at his home in the latter place on Sunday, May 25. He was 57 years old. In 1887 he came to this country from England and located at Scottdale where he has bee nengaged in the manufacture of steel sheets ever since.

Andrew Wallace, vice president of the Fort Wayne Foundry & Machine Co., died at his home in Chicage on Tuesday, May 20. He was 76 years old but despite his advanced age took an active interest in the affairs of the company with which he was identified for many years.

Leonidas C. Jewett, of North Attleboro, Mass., died on May 17, aged 60 years. He was a foundryman and a mechanical engineer of experience and had written many valuable articles on iron and brass founding. He had traveled extensively in South America and Australia.

Henry Perkins, president of Taplin, Rice & Co., manufacturers of stoves and of heavy machinery at Akron, O., died at New York, May 26. He was compelled, because of impaired health, to retire from active business three years ago. Born in Akron in 1842, a son of Gen. Simon Perkins, he served through the war and later entered the office of the Cleveland Rolling Mill Co. He became secretary of Taplin, Rice & Co. in 1870 and on the death of James B. Taplin became president.

The new boiler shop of the American Locomotive Works, Schenectady, N. Y., is now practically completed and will shortly be placed in operation. The building is 650 feet long and 384 feet wide and is commanded by ten traveling cranes with a capacity of 35 tons each. Rapid progress is also being made on the erection of the new foundry which adjoins the new boiler shop. The foundry is of the same size as the boiler shop and will be equipped to do all kinds of heavy work. The new plants have double the capacity of the old boiler shop and foundry.

The fourth blast furnace of the Dominion Iron & Steel Co., at Sydney, Cape Breton, was blown in on May 4.

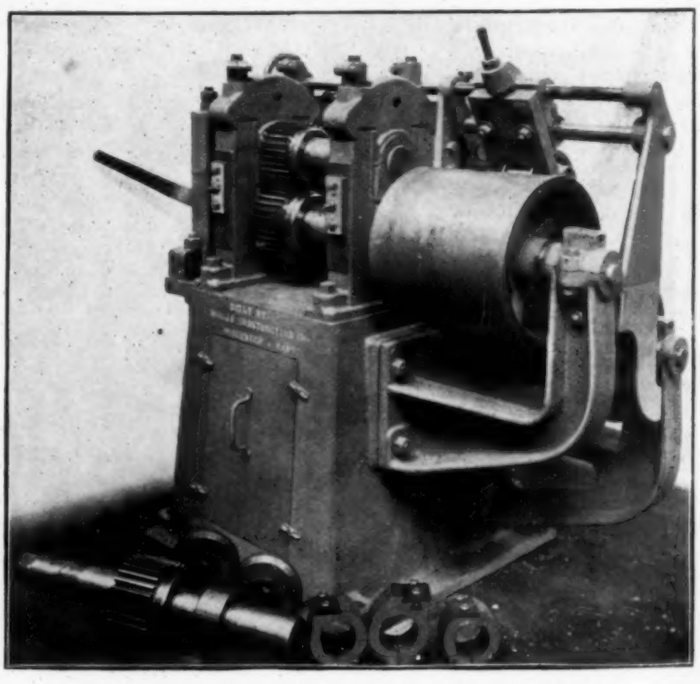


FIG. 8.—REAR VIEW OF DIFFERENTIAL ROTARY FLYING SHEAR.
Note difference in diameter of gears and of cutter heads on floor.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

The capital stock of the Southern Engine & Boiler Works, Jackson, Tenn., has been increased from $74,000 to $200,000.

The Pressed Steel Tank Co., of Milwaukee, Wis., has been incorporated with $100,000 capital and will take over the business of the Seamless Tank Co. of that place. Robert H. Hackney, F. G. Bigelow and G. C. Markham are the incorporators.

The Southern Coal & Iron Co. has been granted a New Jersey charter with a nominal capital of $300,000. T. K. Bullard, L. W. Williams and K. K. McLaren are named as the incorporators. The purpose of the incorporation has not yet been made public.

The Des Moines Iron Co., Des Moines, Ia., has been incorporated with $100,000 capital. D. A. Brown and others are named as the incorporators.

The Elwood Steel Co., of Elwood, Ind., has been incorporated with $10,000 capital by Thomas W. Wrigby, W. J. Alford, Hobart Ames, Oliver Ames and O. W. Wink.

The Davis Gasoline Engine Co., Waterloo, Ia., has increased its capital stock to $200,000 and has changed its name to the Cascaden Mfg. Co.

The Western Iron Works, of Baker City, Ore., has been incorporated with $100,000 capital by Charles F. Soderling, C. W. Hill and C. W. Ward.

The Sterling & Skinner Mfg. Co., Detroit, Mich., has been incorporated with $25,000 capital. R. R. Sterling, F. C. Skinner, E. J. Roney and E. J. McDougall are the incorporators. The new company will engage in the manufacture of brass specialties.

The Ohio Brass Co. has been incorporated under New Jersey laws with $1,000,000 capital.

The American Machine & Ordnance Co., New York, has been incorporated with $10,000,000 capital to engage in the manufacture of guns, ammunition, etc.

The Birmingham Drop Forge & Machine Co., of Birmingham, Ala., has been incorporated with $50,000 capital. A. L. Exell, J. M. Perkins, and John Klotz are the incorporators. The company will immediately erect a plant for the manufacture of drop forgings, etc.

The Central Barb Fence Wire Mfg. Co., of Pekin, Ill., has been incorporated with $5,000 capital. Francis C. Carroll, Otto Koch and Thomas Cooper are the incorporators.

The P. & K. Iron Works, of Pierre, S. D., has been incorporated with $50,000 capital by G. K. March, F. W. Parsons and H. J. Kellam.

The Lindsay & Addison Foundry & Machine Works, Pomona, Cal., has been incorporated with $30,000 capital. G. J. Lindsay, R. Addison, G. A. Lathrop, Iran Addison and W. A. Bell are the incorporators.

The United States Tool Co. has been granted a New Jersey charter with $100,000 capital. The new company will manufacture contractors' tools. George A. Benney, Peter Backes and T. Backes are the incorporators.

The National Corundum Wheel Co., of Fort Hill, N. Y., has been incorporated with $50,000 capital for the purpose of engaging in the manufacture of corundum and emery wheels. O. R. Sprague, J. F. Spohn and John Scheidt are the incorporators.

The Massena Electric Steel Co., of New York, which was recently incorporated with $500,000 capital, will erect its steel making plant at Massena, N. Y., where it will utilize the electric power of the St. Lawrence Power Co. A 100-ton electrical furnace will be immediately installed.

The Canadian Foundry Co., of Hamilton, Ont., has been incorporated with $150,000 capital and will take over the business and plant of the Hamilton Wheel & Foundry Co. R. J. Mercer has been appointed general manager.

The recently incorporated M. J. Johnson Co., Madison, Wis., will erect a plant for the manufacture of gasoline engines.

The American Brass Mfg. Co., St. Louis, Mo., has increased its capital stock from $10,000 to $30,000.

The Paris Brake Co., of Nashville, Tenn., has been incorporated with $8,000 capital. J. L. Stewart, W. E. Harding, J. D. Bowden, L. G. Compton and W. A. Whitworth are the incorporators.

The Riverside Foundry, at Youngstown, O., has been incorporated under the name of the Wright & Finnie Foundry Co. The company could not incorporate under the name of the Riverside Foundry Co. for the reason that such a concern is already in existence at Cleveland, O. William B. Wright, James Wright, John W. Wright, Alexander Finnie and M. Finnie are the incorporators. The capital is $20,000.

The Showmut Iron Co., of Duluth, Minn., has been incorporated with $50,000 capital. The incorporators are Henry L. Fay, F. L. Higginson, M. B. I. Goddard, R. I. H. Goddard, G. W. R. Matteson and W. M. Prindle.

The Caldwell Brothers' Co., Tacoma, Wash., has been incorporated with $100,000 capital by H. M. Caldwell, E. H. Caldwell and A. N. Fitch. The company has engaged in the manufacture of mining machinery for many years, but owing to the recent death of H. B. Caldwell, the founder of the concern, a reorganization was made necessary. The capital stock is $100,000.

The Garden City Wire & Iron Works, Chicago, has been incorporated with $15,000 capital. The company will manufacture wire and metal goods. Thomas Dolan, John J. Cummings and Walter J. Cummings are the incorporators.

Central Barb Fence Wire Mfg. Co., Pekin, Ill., has been incorporated with a capital of $5,000. The incorporators are Francis C. Carroll, Otto Koch and Thomas Cooper.

John A. Waters & Co., Richmond, Va., is in the market for 100-horsepower return tubular boiler that will stand Hartford inspection for 100 pounds steam pressure.

The Robert Aitchison Perforated Metal Co., Plymouth Bldg., Chicago, is in the market for a 65 to 70-h. p. steam engine.

The Piedmont Foundry & Machine Co., Hickory, N. C., has been incorporated with a capital stock of $10,000. J. H. P. Cilley, Gordon H. Cilley and A. A. Shuford, Jr., are the incorporators.

The Consolidated Electric Co., Birmingham, Ala., has been formed as a reorganization of Bullock-McCall-McDonnell Electric Co., dealer and contractor for electric supplies, repairs, etc. The company will build a machine shop.

Bridges, West & Co., Norwood, La., are in the market for a water tank, 3,000 or 3,500 gallons capacity, and steel tower for same, 40 feet.

The Variety Works Co., Dawson, Ga., will buy an iron shaper, with 24-inch stroke, pipe-threading machine, cutting ⅛ to 6 inches.

The Syracuse (N. Y.) Rotary Engine Co. has been incorporated with a capital $10,000. The directors are W. N. Whipple, R. C. Matson, Earl Higbee and W. I. Abels. The engine is the invention of W. N. Whipple.

Fires and Accidents:—

The plant of the Enterprise Stove Co., Vincennes, Ind., has been destroyed by fire entailing a loss of $200,000.

The brass foundry of the P. & F. Corbin Co., New Britain, Conn., was recently destroyed by fire entailing a loss of $50,000.

New Construction:—

Angus Dow will erect a foundry at Fargo, N. D.

The Western Wheeled Scraper Co., Aurora, Ill., announce that the report of a consolidation of the road machine manufacturing companies, published some weeks ago, is untrue.

The Wolcott Windmill Co., Saginaw, Mich., will shortly erect a machine shop for the erection and manufacture of gasoline engines.

The Gadsden Furnace of the Alabama Consolidated Coal & Iron Co., Gadsden, Ala., will shortly be blown out and will be entirely rebuilt. The capacity of the furnace is to be increased from 150 to 200 tons daily.

The Fairbanks-Morse Mfg. Co., Beloit, Wis., has decided to manufacture pumps and pumping machinery on an extensive scale. Four buildings are to be erected in which pumps exclusively will be produced. The foundry will be 132x92 feet; pump erecting shop 300x90 feet, warehouse 150x80 feet and a

power house. M. L. Jenkins will be placed in charge of the plant.

The Wellman-Seaver-Morgan Engineering Co., of Cleveland, has been granted a permit for a brick foundry building to cost $34,000.

The Automatic Machine Co., Greenfield, Conn., which recently purchased the plant of the New England Screw Co., Thompsonville, Conn., will erect an addition to the machine shop of the latter plant during the summer.

The Wolverine Brass Works, Grand Rapids, Mich., is having plans prepared for a two-story foundry building to adjoin its present plant.

The National Electric Co., of Cleveland, which recently bought the old Brush Electric Co.'s plant, will erect additional buildings.

It is officially announced that the Big Four railroad will begin the construction at once in Springfield, O., of shops that will give employment to 800 men. There will be five buildings, a twenty-five stall round house, planing mill, blacksmith shop, machine shop, boiler and tank shop. The appropriation for this year for the work will be $250,000; total appropriation will be $750,000. Both locomotives and cars will be made.

The Southern Brass Co., Lexington, Ky., will erect a new factory building.

The Michaelman Boiler Co., Quincy, Ill., will enlarge its plant at Second and Hampshire Sts.

Modern Iron Works, Quincy, Ill., will erect foundry building, 75x95.

The Columbia Copper Co., it is stated by A. L. Steinmeyer, of St. Louis, secretary of the organization, will soon begin construction work in New Orleans on a large copper working plant.

The Pittsburg District:—

The Severance Mfg. Co., of Pittsburg, manufacturer of spikes, has been incorporated under the laws of Pennsylvania with $500,000 capital. All the properties of the old company have been taken over by the new company.

Hussey, Binns & Co., Ltd., shovel manufacturers of Pittsburg, with works at Charleroi, have been changed from a limited partnership to a corporate concern under the name of Hussey-Binns Shovel Co., with an authorized capital of $2,500,000. R. H. Binns has been elected president, E. H. Alsop vice president, and F. B. Newton superintendent of works.

The annual meeting of the Angeline Dock Co., a subsidiary corporation of Jones & Laughlins, Ltd., Pittsburg, was held last week and officers elected as follows: James Laughlin, Jr., president; W. W. Willock, vice president; John L. Moore, secretary and treasurer, and W. G. Pollock, general manager.

Brush & Stephens Co., of Pittsburg, has been incorporated with a nominal capitalization of $1,000. The company conducts a large pattern shop on Penn Ave.

The machine shop of the McKees Rocks Foundry & Mfg. Co. was placed in operation this week. The company was recently organized with $50,000 capital and will manufacture a patented hoisting jack.

The Braddock Machine & Mfg. Co., Braddock, Pa., will install two additional cupolas with a capacity of 25 tons daily.

The Eagle Foundry & Machine Co., Allegheny, Pa., has plans prepared for the extension of its plant. The present foundry will be rebuilt enlarging it to 140x77 feet. A machine shop 77x100 feet will also be erected. Two 15-ton traveling cranes will be installed as well as a 16-ton cupola.

The George A. Hogg Iron & Steel Foundry Co., of Pittsburg, manufacturer of rolling mill and tin plate mill machinery, is at present very busy running its entire plant night and day. Among the orders recently received is one from the Louisville Bolt & Iron Co., of Louisville, Ky. This is for a 32x72-inch Aetna rolling mill engine; a 26x48-inch Aetna rolling mill engine; a 20-inch train for rolling sheet bars, consisting of three-high pinions, three-high roughing rolls and three-high finishing rolls; a 48-inch squeezer; a 26-inch sheet train consisting of two hot mills and one cold mill and a 38-inch roll lathe. The company also recently received orders for a 38-inch roll lathe from the Maryland Sheet & Steel Co., of Cumberland, Md.; a 24-inch roll lathe from the Superior Steel Co., of Carnegie, Pa.; a 24-inch roll lathe from the Cohoes Rolling Mill Co., of Cohoes, N. Y., and a 24-inch roll lathe from the Illinois Steel Co. for the Joliet works.

The Car Wheel & Foundry Engineering Co., of Pittsburg, will apply for a Pennsylvania charter on June 10. An identified interest known as the Central Car Wheel & Casting Co. will apply for a charter on the same date.

The Columbia Iron & Steel Foundry Co., Pittsburg, is considering the erection of a larger plant where better shipping and other facilities can be secured. The question of location is now being considered. A main building 300x100 feet will be required for the plant. The company manufactures steel castings.

The Empire Chain Co., with a nominal capital of $1,000, will operate a small chain plant near 29th and Smallman Sts., Pittsburg. J. F. Sehn, W. G. McKenney and A. L. Over are the incorporators.

The West Penn Construction Co., with offices in the House Bldg., Pittsburg, has made application for a charter with $10,000 capital and a change in name to the Lucius Construction Co.

The Pittsburg Steel Foundry Co., Pittsburg, has been awarded a contract by the Westinghouse Electric & Mfg. Co. for casting eight steel hubs weighing 70,000 pounds each.

General Industrial Notes:—

The blacksmith, machine and carpenter shops at the lower plant of the American Steel Hoop Co., Youngstown, O., are being dismantled and moved to other sites on the property to make room for the two new merchant mills that are to be added to the plant. The erection of the mills will be commenced shortly.

Joseph Wharton, of Philadelphia, has commenced the erection of a third furnace at the Wharton Iron Works, Port Oram, N. J. The furnace will be completed shortly after the first of next year.

The Victoria Furnace at Goshen, Rockbridge County, Va., which has been out of blast for some time undergoing repairs will be blown in shortly.

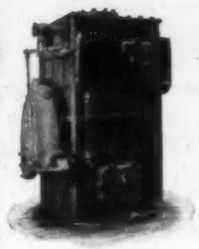
As previously noted in these columns the West Duluth blast furnace, Duluth, Minn., was sold recently and the syndicate purchasing the plant has been incorporated under the name of the Zenith Furnace Co. with $250,000 capital. Kenneth Robertson, formerly manager of the West Superior Iron & Steel Co., has been appointed superintendent of the furnace plant and already has laid out the repairs that are to be made. In addition to increasing the output to about 250 tons per day it has been decided to erect 50 coke ovens for the production of the coke required to operate the furnace. It is probable that the furnace will be blown in about July 1. Pickands, Brown & Co., of Chicago, who have a controlling interest in the new company, will handle the product.

At a meeting of the American Diesel Engine Co. held last week at New York, Hugo Reisinger resigned as secretary and Edwin S. Cramp, vice president of the Cramp Ship Building & Engine Co. of Philadelphia, Pa., was elected a director. President Busch of the company recently visited the plant of the International Power Co., at which the engines are being manufactured and additional orders were given for the manufacture of the engines which tax the capacity of the plant. The International Power Co. holds the manufacturing rights for Diesel engines in the United States, Canada, Great Britain and her colonies.

The Phoenix Horse Shoe Co., Joliet, Ill., resumed operations last week after an idleness of several weeks. The mill of the McKenna Rail Renewing Co. at the same place was placed in operation after an idleness of several months.

The Hank's Foundry Co., Rome, Ga., has placed its new foundry in operation. The plant will be operated on the co-operative system and a specialty will be made of stoves, hollowware, etc.

The abandoned plant of the Western Nail Mill, Belleville, Ill., has been purchased by the recently organized Belleville Foundry Co. and will be converted into a foundry. E. E. Wangelin is president of the company; W. J. Fisher, vice president; W. H. Wangelin, general manager, and I. H. Wangelin, secretary and treasurer.



Cochrane Heater.

Even if you have money to burn—don't burn it.

A man who lets his engine exhaust free to the air and pumps cold water into his boilers, or feeds his boilers with a live steam injector, is simply wasting his money.

If he used his exhaust steam to heat his feed-water, each 10° added to the temperature of the water would save 1% of his entire fuel bill.

Given the necessary exhaust steam, the COCHRANE FEED-WATER HEATER and PURIFIER will heat water of any temperature to practically the boiling point. The average initial temperature is, say, 60°; difference between 60° and 210°=150°--a saving of 15% in fuel (1% for each 10°). In a year this saving would pay for the heater several times over—and a few other things beside.

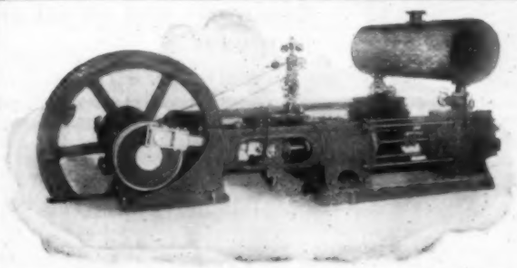
Then the Cochrane Heater saves water—usually over 14% of the total supply required—by conserving the condensed exhaust steam, which, being distilled water, is free from scale forming matter.

There are other advantages of the COCHRANE described in Catalogue 11-H. Write for it.

HARRISON SAFETY BOILER WORKS

Clearfield and 17th Sts. PHILADELPHIA, PA.

SMITH-VAILE AIR COMPRESSORS



Are made of the Straight Line and Duplex types; Single and Multiple Stage Compression; Steam actuated with simple or compound Steam Cylinders, or belt driven, for operating Pneumatic Tools, Hoists, Mining Purposes, Pumping Water, Elevating Fluids, etc.

We also make Stilwell Feed-Water Heaters, Steam and Power Pumping Machinery, and the Victor Turbine Water Wheel. For prices, address,

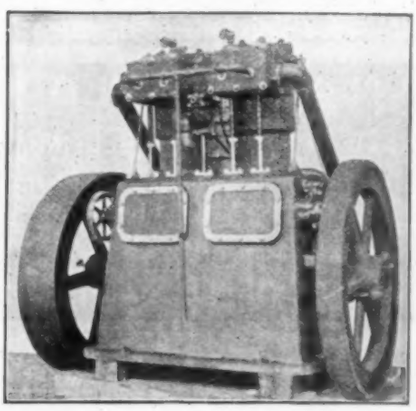
The Stilwell-Bierce & Smith-Vaile Co., M. O. B. 227, DAYTON, OHIO.

TIN PLATES

Coke Charcoal Roofing

Galvanized and Black Sheets

The J M & L A OSBORN CO. CLEVELAND COLUMBUS



Maywood Gas and Gasoline Engines.

Sizes 10 to 60 H. P. Vertical Multiple Cylinder Type-Throttling Governor. Highest Grade. Especially adapted for Electric Lighting and high grade power purposes. **25 and 50 H. P. Engines in Stock for Immediate Shipment.** Write for further information.

Maywood Foundry and Machine Co.,

Chamber of Commerce Bldg., Chicago, Ill.

The Elastic Nut Track-Bolt

makes the best and cheapest rail-fastening. NUTS NEVER WORK LOOSE. Requires no nut-lock. Our Elastic Self-Locking Steel Nut always stays, and is superior for use on Cars, Track, Bridges, Machinery etc. Write us for prices on Sq. and Hex. Nuts, (Elastic or Common) Machine Bolts, Track Bolts, Rivets, etc.

NATIONAL ELASTIC NUT CO.,
MILWAUKEE, WIS.

OF INTEREST TO Manufacturers

Write for copy of pamphlet just issued by the

ILLINOIS CENTRAL R. R. COMPANY

giving reliable information concerning nearly 200 desirable locations for industries, and entitled

INDUSTRIAL SITES IN TEN STATES

Address GEO. C. POWER,
Industrial Commissioner Illinois Central R. R.
ROOM 506 CENTRAL STATION, CHICAGO, ILL.

THE MONTHLY OFFICIAL RAILWAY LIST

Is the oldest, largest, and most complete, and by far the most widely circulated publication of its kind in the world.

A Complete Directory of the Steam Railways of North America and their Officials and Sub-Officials.

The current issue of the "RED" LIST now out. If you are a railroad official, you should have received your copy; if you have not, write us for it at once.

THE OFFICIAL RAILWAY LIST,
315 Dearborn St., Chicago.

Buy your advertising as you do other material—by comparing prices and quality. Compare the "Thirty-Day" List with any other similar publication as regards accuracy and completeness.

CLEVELAND RIVET & FORGING CO.

MANUFACTURERS OF
EAGLE BRAND
RAILROAD FORGINGS. RIVETS SPECIAL FORGINGS
CLEVELAND, OHIO.

Allis-Chalmers Co., CHICAGO.

Perforated Plates

for Incline Shaking and Revolving Screens for Coal Washing and Cleaning, and all other purposes.

Write for Prices.

PERFORATED PLATE SCREENS

AS REQUIRED FOR
Stone, Ore, Zinc, Lead, and all Railroad and Mining Uses.
SPECIAL SCREENS FOR COAL AND COKE.
HENDRICK MFG. CO.,
Samples and information upon request.
Carbondale, Pa.

McLANAHAN-STONE MACHINE CO., (Gaysport Foundry) Hollidaysburg, Pa.

ENTIRE OUFITS for WASHING and DRESSING ORES and PHOSPHATES at Least Cost.
Improved Washers with steel or wood logs. Screens, cylindrical and conical of all descriptions. Steel, slow moving elevators and conveyors. Picking Belts for coarse material and hard usage. Friction Hoists. Single Roll Crushers for rough crushing in large quantities.
CASTINGS of every DESCRIPTION. ESPECIALLY HEAVY ONES.

Do You Seek Trade With the Foundries?

THERE are 5,933 foundries in this country and Canada.
1,055 of these are new concerns which have come into existence during the past two years.
More than 600 foundries quit business during the same period.
The chances are that your mail matter does not reach all of the new firms. It is also a safe proposition to gamble that you are sending out letters right along to people who have quit the foundry business.
The way for you to cover the foundry trade completely is to have a copy of

Penton's Foundry List FOR 1902

in your office. This is the only reliable directory of foundries published. It is now ready for delivery. Only a limited edition will be printed, so you had better order a copy early.
The salesman on the road says that with a copy of this list in his pocket he can get over the ground in half the time and see everybody. Without it he is looking up people who have no foundries and missing others who have. It will be money in your pocket to see that your men have a copy.

The Iron and Steel Press Co., Pubs., Cleveland, O.

The "ORIGINAL GANDY"

STITCHED COTTON DUCK BELTING,

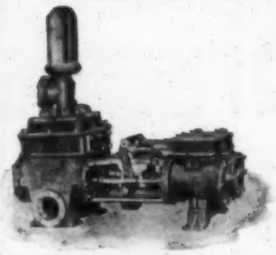
Especially adapted for Main Drivers, Saw Mills, Cotton Gins, Cotton Presses, and for all places where belts are subjected to moisture or atmospheric changes, the "GANDY" stands paramount.
For further information, prices, etc., write

THE GANDY BELTING CO., Baltimore, Md.

PHOENIX HORSE SHOES Are the Best Shoes Made.

CATALOGUE SENT ON REQUEST.
PHOENIX HORSE SHOE CO., POUGHKEEPSIE, N. Y.—JOLIET, ILL.

FOR PUMPING OUT MINES, QUARRIES, EXCAVATIONS,



or for getting rid of dirty water anywhere, which would ruin the ordinary steam pump, use the **Blakeslee Jet Pump.** It will work when other forms of pumping machinery are absolutely useless. There are no valves or other complicated parts to wear out in the **Blakeslee,** and as long as you have steam in your boiler you are ready for business.

Be sure the words **"Blakeslee Jet"** are on the pump you buy for rough service, otherwise you will not have the genuine. :: ::

BLAKESLEE MFG. CO., Du Quoin, Ill.

RUBEROID

HIGHEST AWARD,
GOLD MEDAL
AT PAN-AMERICAN.

A Superior Factory Roofing.
THE STANDARD PAINT COMPANY,
100 William St., NEW YORK.
188-190 Madison St., CHICAGO.

CRANE FITTINGS
ESTABLISHED 1855

Who Builds the best Mine Pump?

Prescott.

Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.

PROTECT

From Rust, Fire, Sun, Water and Weather by using our products. . .

Pure Red Lead

Kept from settling by our **Double Oxygenized, Pure Linseed Oil.**

The National Fireproof Paint Co.
40 Dearborn St., Chicago, Ill.

DEPARTMENT "B"

"We will appreciate your inquiries."

Forgings
FOR ALL POSSIBLE PURPOSES made as they should be.

CRAWSHAW & JUDD,
51 Union St., WORCESTER, MASS.

Imhauser's Watchman's Time Detectors
That cannot Fail.

Highest Award Pan-American Exposition

Made with 12 or 24 different keys. Contain all the modern improvements. Warranted in every way. Cannot be tampered with, without detection.

Manufactured by **E. IMHAUSER & CO.,**
Write for catalogue. 206 Broadway, N. Y.

FORGINGS.
PIG IRON, COAL, COKE,
PILLING & CRANE.
PHILADELPHIA: Girard Building. PITTSBURG: Lewis Building. NEW YORK: Empire Bldg.

THE CHICAGO SCREW CO.
SET, CAP and MACHINE
Hexagon Nuts, Studs, Etc. **SCREWS.** Coupling Bolts Specials.
No. 2 N. Canal St., - - CHICAGO.

If you want an automatic stoker that is entirely automatic.
If you want to save labor and cost of firing.
If you want to be able to burn a cheap coal instead of a high grade.
If you want smokeless combustion.
Then you want the

Green Traveling Link Chain Grate.

Write to the **Green Engineering Co.,**
Western Union Bldg.,
Get our complete catalogue. CHICAGO, ILL.

DIXON'S SOLID Belt Dressing

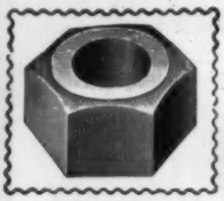
For the busy man, the Solid Belt Dressing is a great convenience. We do not recommend it quite so highly as our Paste Dressing, but it is possibly superior to anything of the kind in the market.

SAMPLE SIZE FREE.

JOSEPH DIXON CRUCIBLE CO.,
JERSEY CITY, N. J.

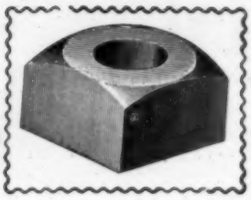
THE MILTON MANUFACTURING CO.,

Milton, Pa.



MANUFACTURERS OF

COLD PUNCHED NUTS



Hot Pressed Nuts, Plate Washers, etc.

Quality and Finish the Best. **Send Specifications for Prices.**

American Iron & Steel Mfg. Co.

General Offices at Lebanon, Pa., U. S. A.

MANUFACTURERS OF

MERCHANT BAR IRON

(Annual Capacity AND STEEL about 150,000 Tons)

Also Every Variety of

Machine Bolts, Nuts, Washers, Turnbuckles, Lag Screws

Railway and Dock Spikes, Harbey Grip and other Railway Track Bolts

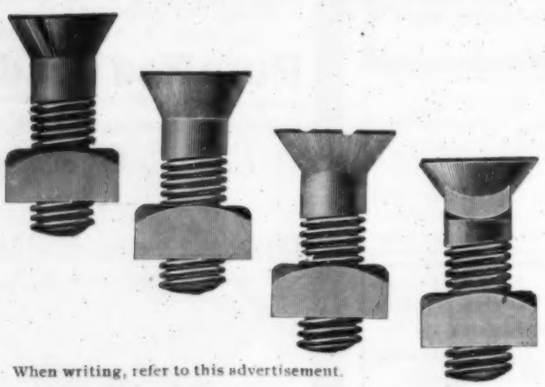
Boiler, Ship and Structural Rivets

CAR FORGINGS and RODS AND IRONS FOR BRIDGES, BUILDINGS, ETC., ETC.

This Company owns and operates the works formerly owned by

J. H. STERNBERGH & SON, Reading, Pa. NATIONAL BOLT, NUT AND RIVET WORKS, Reading, Pa. LEBANON IRON CO., Lebanon, Pa

EAST LEBANON IRON CO., Lebanon, Pa. PENNSYLVANIA BOLT AND NUT CO., Lebanon, Pa.



Plow & Cultivator Bolts

OF ALL KINDS.

QUALITY THE VERY BEST.

PRICES RIGHT.

THE UPSON NUT CO.,

CLEVELAND, OHIO.

When writing, refer to this advertisement.

REPUBLIC IRON & STEEL CO., CHICAGO, ILL.

BAR IRON BAR STEEL

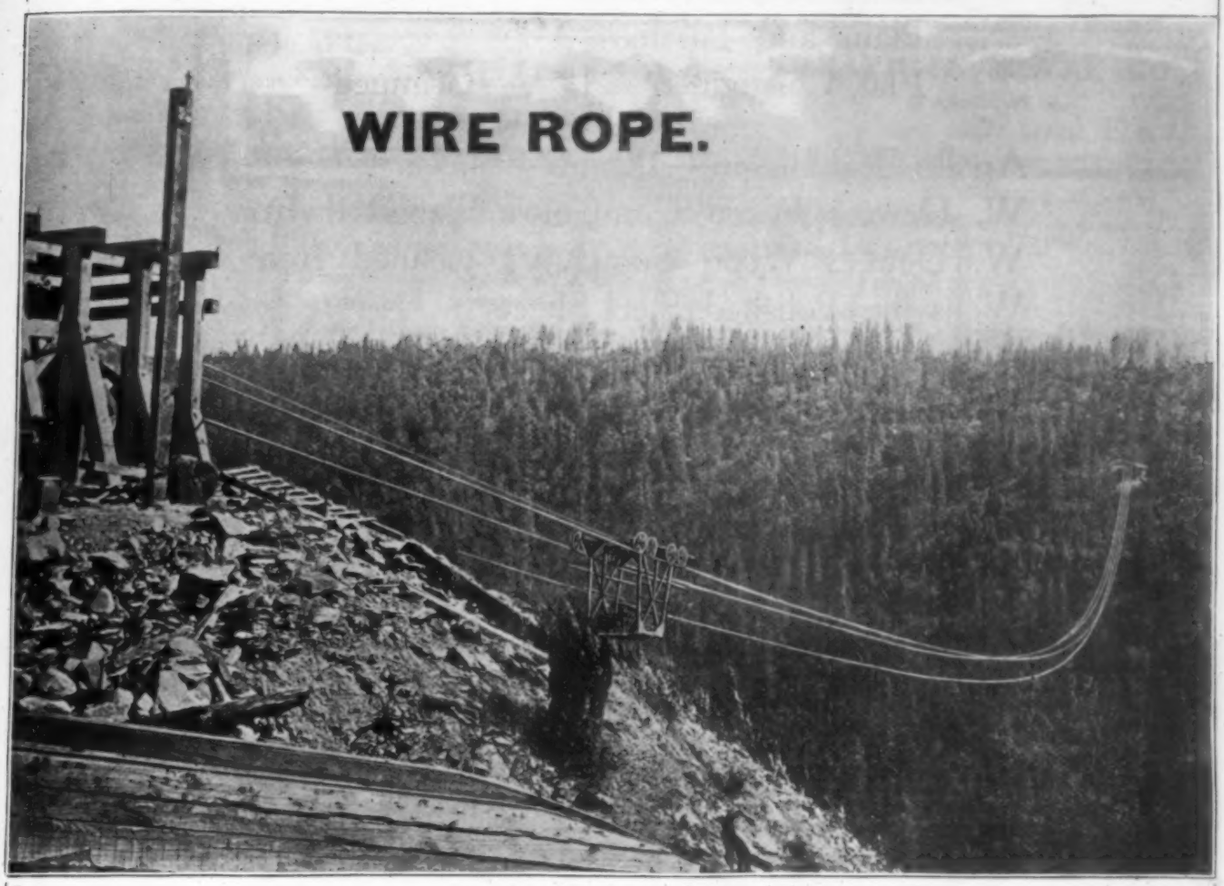
MACHINE BOLTS, CARRIAGE BOLTS, GIMLET POINT COACH SCREWS, TURNBUCKLES.

NUTS. **R. R. SPIKES.** **PIG IRON.**

NEW YORK, CLEVELAND, BIRMINGHAM, BUFFALO, CINCINNATI, ST. PAUL, SAN FRANCISCO, ST. LOUIS, BUTTE, MONT.

American Steel & Wire Co.

CHICAGO, The Rookery. NEW YORK, Empire Bldg. WORCESTER, MASS. DENVER, 809 17th St. SAN FRANCISCO, 8 and 10 Pine St.



WIRE OF EVERY DESCRIPTION, round, flat, square, triangular and odd-shaped. Barbed Wire. Music Wire. Bale Ties. Wire Rods. Wire Hoops. Mattress, Broom, Weaving and Market Wires. Special Wires adapted to all purposes.

NAILS, STAPLES, SPIKES and TACKS. Standard Wire Nails in all sizes and shapes. Miscellaneous Fine Nails. Tacks in count and weight packages. Dowel Pins.

ELECTRICAL WIRES and CABLES, bare and insulated. Telegraph and Telephone Wires.

RAIL BONDS for Electric Roads.

SPRINGS, Clock, Motor, Car, Furniture, Agricultural and all kinds of Fine and Heavy Springs.

COPPERAS and VENETIAN RED.

POULTRY NETTING, galvanized before weaving. All meshes and sizes.

HORSE SHOES, "Juniata" brand, iron or steel, in all sizes and patterns. Toe Calks.

COLD DRAWN STEEL, SHAFTING, Free Cutting Screw Steel. Roller Bearing Rods, Rounds, Squares, Hexagons, Flats and Special Shapes.

PLATES AND SHEETS of Bessemer and Open Hearth Steel.

American Sheet Steel Company

Battery Park Building New York

Manufacturers of all varieties of

IRON AND STEEL SHEETS

Black and Galvanized
Plain and Painted
Flat, Corrugated and "V" Crimped

Apollo Best Bloom Galvanized Sheets
W. Dewees Wood Company's Planished Iron
W. Dewees Wood Company's Refined Iron
Wellsville Polished Steel Sheets

DISTRICT SALES AGENTS

W. J. Wetstein & John W. Goon, Security Building, St. Louis
S. J. Waterman, Union Trust Bldg., Cincinnati
Hoge & Swift, Portland, Oregon
F. A. Goodrich & Company, Chamber of Commerce, Detroit
Wm. B. Isaacs, 226 Market Street, San Francisco
B. & S. H. Thompson & Company, Montreal, Canada
T. W. Simpers, Land Title Building, Philadelphia
F. C. Milliken, Vandergrift Building, Pittsburg
S. L. Mitchel, Hennen Building, New Orleans
W. T. Shannon, 34 West Ninth Street, Chattanooga
Lee Chamberlain, Los Angeles
L. A. Hastings, 1622 Arapahoe Street, Denver

DISTRICT SALES OFFICE: MARQUETTE BUILDING, CHICAGO

H. H. DICKEY, Pres. A. F. BAUMGARTEN, V. Pres. H. E. WEBER, Sec'y & Treas.

SHEETS OPEN HEARTH-BLUE ANNEALED,

GAUGES 10 TO 22, WIDTHS UP TO 48".

BLACK PLATES, HARROW DISCS, BILLETS.

FORGINGS, OPEN-HEARTH STEEL CASTINGS, BARS.

MARYLAND SHEET & STEEL CO., Cumberland, Md.

WAUKESHA SHEET STEEL COMPANY, WAUKESHA, WIS.

Manufacturers of BLACK and GALVANIZED SHEETS, PLAIN and PAINTED, FLAT and CORRUGATED.

Works and General Office, WAUKESHA, WIS.

Are you a Back Number?

You are if you use galvanized sheets. Be progressive and use ALUMINUM COATED SHEET STEEL. The most durable coated sheet on the market. Can be soldered with common solder.

The Steel & Iron Aluminum Coating Co., CONNELLSVILLE, PA.

STEEL CASTINGS That will Forge, Weld and Temper. Will not Crystallize.

Graphite through the metal breaks up vibration.

GRAPHITE METAL CO., 17 Cortlandt St., NEW YORK, U. S. A.

This (MF) trade mark is stamped on every sheet of the best roofing tin made. This (MF) mark means "Most Favored," because this brand is most favored by architects, dealers, and builders everywhere. MF Roofing Tin was first made in Wales 50 years ago—later the process was improved in America—and the product developed, until now MF Roofing Tin is more in demand than any other brand. The superior quality of MF Roofing Tin is attested by the first prize awarded it at the Paris Exposition, 1900, where it was in competition with all the world.

MF

The entire tinning process is effected by skilled hand labor, without the use of acids or rolls. The very best plates, the greatest amount of pure tin and new lead, the utmost care in manufacture, successively contribute to making MF the best of all roofing. It is most economical, because it lasts longest—many roofs made of MF 50 years ago are sound as ever today. MF Roofing Tin is sold by dealers everywhere. Specify it in your building estimates. Ask your roofer,

or write { W. C. CRONEMEYER, Agent, Carnegie Building, Pittsburg

and receive illustrated book on roofing.

AMERICAN TIN PLATE COMPANY, NEW YORK.

Men Who Think

About the fitness of things must recognize the value of attracting the attention of proprietors, managers and superintendents of machine shops. They well know that these same men know a great deal more about what tools and equipment they should buy than they used to know. They don't trust to foreman and machinists to recommend tools to them as they once did. If you will watch THE IRON TRADE REVIEW you will understand that it reaches the *managerial* and *buying* side, or, in other words, proprietors and managers and superintendents.

THE IRON TRADE REVIEW,

Cleveland. Chicago. Pittsburg. New York.

A RECORD WHICH STANDS ALONE!

ONE HUNDRED AND FIFTY TONS OF WIRE in a 22-hour run with only thirty-six Blocks.

THE SUPERFICIAL OBSERVER thinks our prices for Wire Benches are very high. He sees a bench, blocks and shaft, and realizes the fact they turn around just the same as the bench of twenty-five years ago did. He realizes that they are a little heavy, but don't see very much difference.

THE MANUFACTURER WHO GOES INTO THE MATTER FULLY realizes the fact that our benches are carefully designed, our gearing all open-hearth steel, that all parts are heavy, with the result that our regular one-hundred-ton outfits have only thirty-six blocks, where the other manufacturers of wire machinery reckon sixty.

THE RESULT IS SIMPLY THIS: By installing an equipment of our machinery, the money you will save in wire-drawers' wages will pay for our plant complete in less than two years' time.

UP-TO-DATE MANUFACTURERS realize this and are equipping their mills with our machinery, paying the extra price. You had better look into this matter—it may save you dollars. Shall be pleased to hear from you.

THE TURNER, VAUGHN & TAYLOR CO., Cuyahoga Falls, O.

THE CUYAHOGA STEEL & WIRE COMPANY,

Office and Works: CUYAHOGA FALLS, O.

MANUFACTURERS OF

WIRE RODS.

Annealed and Galvanized Fence Wire.
Bright, Tinned and Coppered Market Wire
Tinned Mattress and Broom Wire.
Annealed Stone Wire.

Wire Straightened and Cut to Lengths.

WIRE NAILS.

THE

LORAIN STEEL COMPANY,

Lorain, Ohio.

Rails, Blooms, Billets and Slabs.

American Steel Hoop Company

GENERAL SALES OFFICES: CARNEGIE BUILDING, PITTSBURGH, PA.

DISTRICT SALES OFFICES:

ATLANTA: Equitable Building BOSTON: Telephone Building BUFFALO: German Insurance Building
CHICAGO: The Rookery CINCINNATI: Union Trust Building CLEVELAND: Perry-Payne Building
DENVER: People's Bank Building DETROIT: Union Trust Building NEW YORK: Empire Building
PHILADELPHIA: Harrison Building SAN FRANCISCO: 258 Market Street
ST. LOUIS: Chemical Building ST. PAUL: Pioneer Press Building WASHINGTON: National Safe Deposit Building

FOREIGN SALES OFFICES:

LONDON, ENG.: 71 and 72 King William Street MONTREAL, CANADA: Bell Telephone Building
CITY OF MEXICO, 924 Apartado.